OM-492 190 603BB

November 2003

## Processes

MIG (GMAW) and Pulsed MIG (GMAW-P) Welding

Flux Cored (FCAW) Welding

Stick (SMAW) Welding

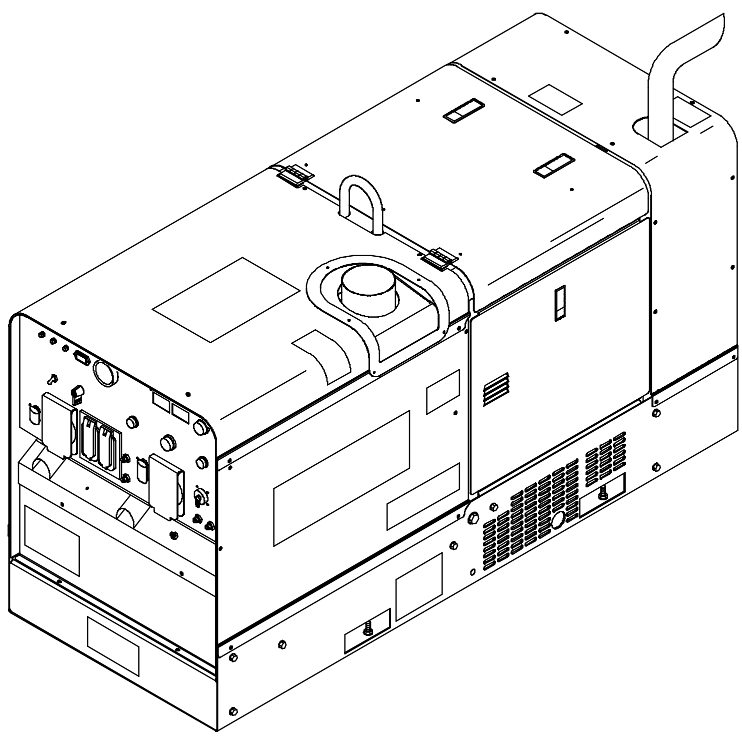
TIG (GTAW) Welding

Air Carbon Arc (CAC-A) Cutting and Gouging

## Description

Engine Driven Welding Generator

# PipePro™ 304



# OWNER'S MANUAL

Visit our website at

**www.MillerWelds.com**

# From Miller to You

*Thank you* and *congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

ISO 9001:2000 REGISTERED QUALITY SYSTEM

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

TRUE BLUE® WARRANTY

Working as hard as you do − every power source from Miller is backed by the most hassle-free warranty in the business.



Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual catalog sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**

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# TABLE OF CONTENTS

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# SECTION 1 − SAFETY PRECAUTIONS − READ BEFORE USING

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▲ **Warning: Protect yourself and others from injury — read and follow these precautions.**

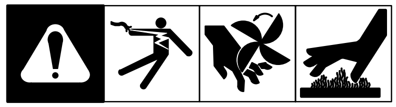
## 1-1. Symbol Usage



Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means "Note"; not safety related.*



This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

## 1-2. Arc Welding Hazards

▲ **The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-7. Read and follow all Safety Standards.**

▲ **Only qualified persons should install, operate, maintain, and repair this unit.**

▲ **During operation, keep everybody, especially children, away.**



### ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground — check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first − double-check connections.
- Frequently inspect input power cord for damage or bare wiring — replace cord immediately if damaged — bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal.

**SIGNIFICANT DC VOLTAGE exists in inverters after stopping engine.**

- Stop engine on inverter and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



### FUMES AND GASES can be hazardous.

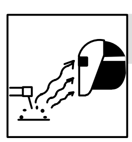
Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
- If ventilation is poor, use an approved air-supplied respirator.
- Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



### BUILDUP OF GAS can injure or kill.

- Shut off shielding gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



### ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

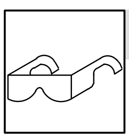
- Wear a welding helmet fitted with a proper shade of filter to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.



### WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Protect yourself and others from flying sparks and hot metal.
- Do not weld where flying sparks can strike flammable material.
- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWS F4.1 (see Safety Standards).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



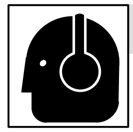
### FLYING METAL can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



### HOT PARTS can cause severe burns.

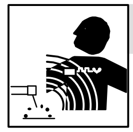
- Allow cooling period before maintaining.
- Wear protective gloves and clothing when working on a hot engine.
- Do not touch hot engine parts or just-welded parts bare-handed.



### NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



### MAGNETIC FIELDS can affect pacemakers.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

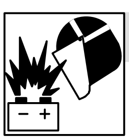


### CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

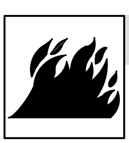
- Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder — explosion will result.
- Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

## 1-3. Engine Hazards



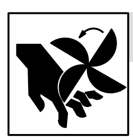
### BATTERY EXPLOSION can BLIND.

- Always wear a face shield, rubber gloves, and protective clothing when working on a battery.
- Stop engine before disconnecting or connecting battery cables or servicing battery.
- Do not allow tools to cause sparks when working on a battery.
- Do not use welder to charge batteries or jump start vehicles.
- Observe correct polarity (+ and −) on batteries.
- Disconnect negative (−) cable first and connect it last.



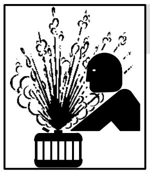
### FUEL can cause fire or explosion.

- Stop engine and let it cool off before checking or adding fuel.
- Do not add fuel while smoking or if unit is near any sparks or open flames.
- Do not overfill tank — allow room for fuel to expand.
- Do not spill fuel. If fuel is spilled, clean up before starting engine.
- Dispose of rags in a fireproof container.
- Always keep nozzle in contact with tank when fueling.



### MOVING PARTS can cause injury.

- Keep away from fans, belts, and rotors.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Stop engine before installing or connecting unit.
- Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
- To prevent accidental starting during servicing, disconnect negative (−) battery cable from battery.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall panels or guards and close doors when servicing is finished and before starting engine.
- Before working on generator, remove spark plugs or injectors to keep engine from kicking back or starting.
- Block flywheel so that it will not turn while working on generator components.



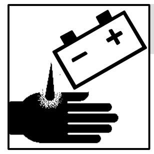
### STEAM AND HOT COOLANT can burn.

- If possible, check coolant level when engine is cold to avoid scalding.
- Always check coolant level at overflow tank, if present on unit, instead of radiator (unless told otherwise in maintenance section or engine manual).
- If the engine is warm, checking is needed, and there is no overflow tank, follow the next two statements.
- Wear safety glasses and gloves and put a rag over radiator cap.
- Turn cap slightly and let pressure escape slowly before completely removing cap.



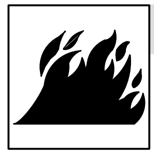
### ENGINE EXHAUST GASES can kill.

- Use equipment outside in open, well-ventilated areas.
- If used in a closed area, vent engine exhaust outside and away from any building air intakes.



### BATTERY ACID can BURN SKIN and EYES.

- Do not tip battery.
- Replace damaged battery.
- Flush eyes and skin immediately with water.



### ENGINE HEAT can cause fire.

- Do not locate unit on, over, or near combustible surfaces or flammables.
- Keep exhaust and exhaust pipes way from flammables.



### EXHAUST SPARKS can cause fire.

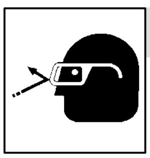
- Do not let engine exhaust sparks cause fire.
- Use approved engine exhaust spark arrestor in required areas — see applicable codes.

## 1-4. Compressed Air Hazards



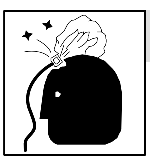
### BREATHING COMPRESSED AIR can cause serious injury or death.

- Do not use compressed air for breathing.
- Use only for cutting, gouging, and tools.



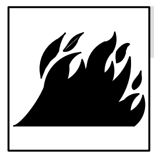
### COMPRESSED AIR can cause injury.

- Wear approved safety goggles.
- Do not direct air stream toward self or others.



### TRAPPED AIR PRESSURE AND WHIPPING HOSES can cause injury.

- Release air pressure from tools and system before servicing, adding or changing attachments, or opening compressor oil drain or oil fill cap.



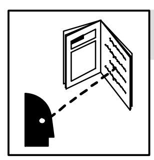
### HOT METAL from air arc cutting and gouging can cause fire or explosion.

- Do not cut or gouge near flammables.
- Watch for fire; keep extinguisher nearby.



### HOT PARTS can cause burns and injury.

- Do not touch hot compressor or air system parts.
- Let system cool down before touching or servicing.



### READ INSTRUCTIONS.

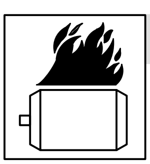
- Read Owner's Manual before using or servicing unit.
- Stop engine and release air pressure before servicing.

## 1-5. Additional Symbols For Installation, Operation, And Maintenance



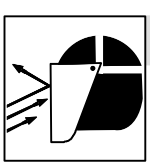
### FALLING UNIT can cause injury.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, trailer, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.



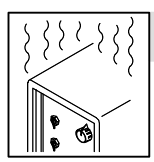
### OVERHEATING can damage motors.

- Turn off or unplug equipment before starting or stopping engine.
- Do not let low voltage and frequency caused by low engine speed damage electric motors.
- Do not connect 50 or 60 Hertz motors to the 100 Hertz receptacle where applicable.



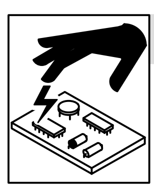
### FLYING SPARKS can cause injury.

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



### OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



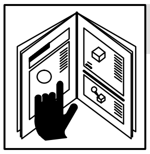
### STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



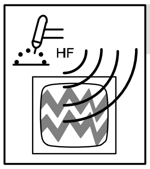
### TILTING OF TRAILER can cause injury.

- Use tongue jack or blocks to support weight.
- Properly install welding generator onto trailer according to instructions supplied with trailer.



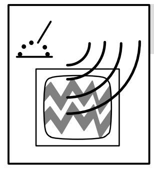
### READ INSTRUCTIONS.

- Use only genuine MILLER/Hobart replacement parts.
- Perform engine and air compressor (if applicable) maintenance and service according to this manual and the engine/air compressor (if applicable) manuals.




### H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.



### ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as microprocessors, computers, and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

## 1-6. California Proposition 65 Warnings

▲ **Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)**

▲ **Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.**

**For Gasoline Engines:**

▲ **Engine exhaust contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

**For Diesel Engines:**

▲ **Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.**

## 1-7. Principal Safety Standards

*Safety in Welding, Cutting, and Allied Processes,* ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (phone: 305-443-9353, website: www.aws.org).

*Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping,* American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (phone: 305-443-9353, website: www.aws.org).

*National Electrical Code,* NFPA Standard 70, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org and www. sparky.org).

*Safe Handling of Compressed Gases in Cylinders,* CGA Pamphlet P-1, from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (phone: 703-412-0900, website: www.cganet.com).

*Code for Safety in Welding and Cutting,* CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3 (phone: 800-463-6727 or in Toronto 416-747-4044, website: www.csa-international.org).

*Practice For Occupational And Educational Eye And Face Protection,* ANSI Standard Z87.1, from American National Standards Institute, 11 West 42nd Street, New York, NY 10036–8002 (phone: 212-642-4900, website: www.ansi.org).

*Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* NFPA Standard 51B, from National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269-9101 (phone: 617-770-3000, website: www.nfpa.org and www. sparky.org).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (there are 10 Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

## 1-8. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

Welding current, as it flows through welding cables, will cause electromagnetic fields. There has been and still is some concern about such fields. However, after examining more than 500 studies spanning 17 years of research, a special blue ribbon committee of the National Research Council concluded that: "The body of evidence, in the committee's judgment, has not demonstrated that exposure to power-frequency electric and magnetic fields is a human-health hazard." However, studies are still going forth and evidence continues to be examined. Until the final conclusions of the research are reached, you may wish to minimize your exposure to electromagnetic fields when welding or cutting.

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep welding power source and cables as far away from operator as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

**About Pacemakers:**

Pacemaker wearers consult your doctor first. If cleared by your doctor, then following the above procedures is recommended.

# SECTION 2 − CONSIGNES DE SÉCURITÉ − LIRE AVANT UTILISATION

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**▲ Avertissement: Protégez vous et les autres des blessures − lisez et suivez ces précautions.**

## 2-1. Signification des symboles



Signifie Mise en garde ! Soyez vigilant ! Cette procédure présente des risques de danger ! Ceux-ci sont identifiés par des symboles adjacents aux directives.

▲ **Identifie un message de sécurité particulier.**

☞ *Signifie NOTA ; n'est pas relatif à la sécurité.*



Ce groupe de symboles signifie Mise en garde ! Soyez vigilant ! Il y a des risques de danger reliés aux CHOCS ÉLECTRIQUES, aux PIÈCES EN MOUVEMENT et aux PIÈCES CHAUDES. Reportez-vous aux symboles et aux directives ci-dessous afin de connaître les mesures à prendre pour éviter tout danger.

## 2-2. Dangers relatifs au soudage à l'arc

▲ **Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci-après ne font que résumer l'information contenue dans les normes de sécurité énumérées à la section 2-6 . Veuillez lire et respecter toutes ces normes de sécurité.**

▲ **L'installation, l'utilisation, l'entretien et les réparations ne doivent être confiés qu'à des personnes qualifiées.**

▲ **Au cours de l'utilisation, tenir toute personne à l'écart et plus particulièrement les enfants.**



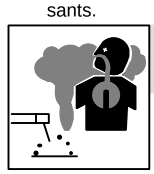
### UN CHOC ÉLECTRIQUE peut tuer.

Un simple contact avec des pièces électriques peut provoquer une électrocution ou des blessures graves. L'électrode et le circuit de soudage sont sous tension dès que l'appareil est sur ON. Le circuit d'entrée et les circuits internes de l'appareil sont également sous tension à ce moment-là. En soudage semi-automatique ou automatique, le fil, le dévidoir, le logement des galets d'entraînement et les pièces métalliques en contact avec le fil de soudage sont sous tension. Des matériels mal installés ou mal mis à la terre présentent un danger.

- Ne jamais toucher les pièces électriques sous tension.
- Porter des gants et des vêtements de protection secs ne comportant pas de trous.
- S'isoler de la pièce et de la terre au moyen de tapis ou d'autres moyens isolants suffisamment grands pour empêcher le contact physique éventuel avec la pièce ou la terre.
- Ne pas se servir de source électrique àcourant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique àcourant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique àcourant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- Des précautions de sécurité supplémentaires sont requises dans des environnements à risque comme: les endroits humides ou lorsque l'on porte des vêtements mouillés; sur des structures métalliques au sol, grillages et échafaudages; dans des positions assises, à genoux et allongées; ou quand il y a un risque important de contact accidentel avec la pièce ou le sol. Dans ces cas utiliser les appareils suivants dans l'ordre de préférence: 1) un poste à souder DC semi−automatique de type CV (MIG/MAG), 2) un poste à souder manuel (électrode enrobée) DC, 3) un poste à souder manuel AC avec tension à vide réduite. Dans la plupart des cas, un poste courant continu de type CV est recommandé. Et, ne pas travailler seul!
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installer et mettre à la terre correctement cet appareil conformément à son manuel d'utilisation et aux codes nationaux, provinciaux et municipaux.
- Toujours vérifier la terre du cordon d'alimentation − Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Vérifier fréquemment le cordon d'alimentation pour voir s'il n'est pas endommagé ou dénudé − remplacer le cordon immédiatement s'il est endommagé − un câble dénudé peut provoquer une électrocution.
- Mettre l'appareil hors tension quand on ne l'utilise pas.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct − ne pas utiliser le connecteur de pièce ou le câble de retour.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité quand on travaille en hauteur.
- Maintenir solidement en place tous les panneaux et capots.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.

**Une tension DC importante subsiste à l'intérieur des onduleurs après avoir coupé l'alimentation.**

- Couper l'alimentation du poste et décharger les condensateurs d'entrée comme indiqué dans la Section Maintenance avant de toucher des composants.



### LES FUMÉES ET LES GAZ peuvent être dangereux.

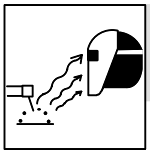
Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereux pour votre santé.

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'interieur, ventiler la zone et/ou utiliser un échappement au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est insuffisante, utiliser un respirateur à alimentation d'air homologué.
- Lire les spécifications de sécurité des matériaux (MSDSs) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraisseurs.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé, et si nécessaire, en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.



### LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- Fermer l'alimentation du gaz protecteur en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.



### LES RAYONS DE L'ARC peuvent provoquer des brûlures dans les yeux et sur la peau.

Le rayonnement de l'arc du procédé de soudage génère des rayons visibles et invisibles intenses (ultraviolets et infrarouges) susceptibles de provoquer des brûlures dans les yeux et sur la peau. Des étincelles sont projetées pendant le soudage.

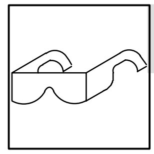
- Porter un casque de soudage muni d'un écran de filtre approprié pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des protections approuvés pour les oreilles si le niveau sondre est trop élevé.
- Utiliser des écrans ou des barrières pour protéger des tiers de l'éclair et de l'éblouissement; demander aux autres personnes de ne pas regarder l'arc.
- Porter des vêtements de protection constitué dans une matière durable, résistant au feu (laine ou cuir) et une protection des pieds.



### LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Ne pas souder dans un endroit là où des étincelles peuvent tomber sur des substances inflammables.
- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 (voir les normes de sécurité).
- Brancher le câble sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection dépourvus d'huile tels que des gants en cuir, une chemise en matériau lourd, des pantalons sans revers, des chaussures hautes et un couvre chef.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.



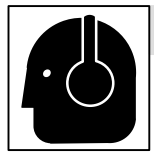
### DES PARTICULES VOLANTES peuvent blesser les yeux.

- Le soudage, l'écaillement, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.



### DES PIÈCES CHAUDES peuvent provoquer des brûlures graves.

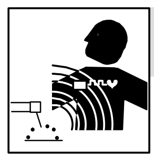
- Prévoir une période de refroidissement avant d'effectuer des travaux d'entretien.
- Porter des gants et des vêtements de protection pour travailler sur un moteur chaud.
- Ne pas toucher à mains nues les parties chaudes du moteur ni les pièces récemment soudées.



### LE BRUIT peut affecter l'ouïe.

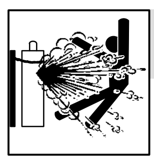
Le bruit des processus et des équipements peut affecter l'ouïe.

- Porter des protections approuvés pour les oreilles si le niveau sondre est trop élevé.



### LES CHAMPS MAGNÉTIQUES peuvent affecter les stimulateurs cardiaques.

- Porteurs de stimulateur cardiaque, restez à distance.
- Les porteurs d'un stimulateur cardiaque doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de gougeage ou de soudage par points.

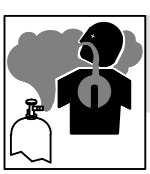


### Si des BOUTEILLES sont endommagées, elles pourront exploser.

Des bouteilles de gaz protecteur contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

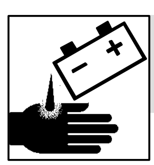
- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée − risque d'explosion.
- Utiliser seulement des bouteilles de gaz protecteur, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Ne pas tenir la tête en face de la sortie en ouvrant la soupape de la bouteille.
- Maintenir le chapeau de protection sur la soupape, sauf en cas d'utilisation ou de branchement de la bouteille.
- Lire et suivre les instructions concernant les bouteilles de gaz comprimé, les équipements associés et les publication P-1 CGA énumérées dans les normes de sécurité.

## 2-3. Dangers existant en relation avec le moteur



### LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

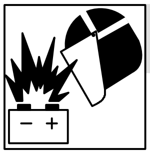
- Fermer l'alimentation du gaz protecteur en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.





### L'ACIDE DE LA BATTERIE peut provoquer des brûlures dans les YEUX et sur la PEAU.

- Ne pas renverser la batterie.
- Remplacer une batterie endommagée.
- Rincer immédiatement les yeux et la peau à l'eau.



### L’EXPLOSION DE LA BATTERIE peut RENDRE AVEUGLE.

- Toujours porter une protection faciale, des gants en caoutchouc et vêtements de protection lors d’une intervention sur la batterie.
- Arrêter le moteur avant de débrancher ou de brancher les câbles de batterie.
- Eviter de provoquer des étincelles avec les outils en travaillant sur la batterie.
- Ne pas utiliser le poste de soudage pour charger les batteries ou des véhicules de démarrage rapide.
- Observer la polarité correcte (+ et −) sur les batteries.
- Débrancher le câble négatif (–) en premier lieu. Le rebrancher en dernier lieu.



### LE CARBURANT MOTEUR peut provoquer un incendie ou une explosion.

- Arrêter le moteur avant de vérifier le niveau de carburant ou de faire le plein.
- Ne pas faire le plein en fumant ou proche d’une source d’étincelles ou d’une flamme nue.
- Ne pas faire le plein de carburant à ras bord; prévoir de l’espace pour son expansion.
- Faire attention de ne pas renverser de carburant. Nettoyer tout carburant renversé avant de faire démarrer le moteur.
- Jeter les chiffons dans un récipient ignifuge.



### DES ORGANES MOBILES peuvent provoquer des blessures.

- Ne pas approcher les mains des ventilateurs, courroies et autres pièces en mouvement.
- Maintenir fermés et fixement en place les portes, panneaux, recouvrements et dispositifs de protection.
- Arrêter le moteur avant d’installer ou brancher l’appareil.
- Demander seulement à un personnel qualifié d’enlever les dispositifs de sécurité ou les recouvrements pour effectuer, s’il y a lieu, des travaux d’entretien et de dépannage.
- Pour empêcher tout démarrage accidentel pendant les travaux d’entretien, débrancher le câble négatif (−) de batterie de la borne.
- Ne pas approcher les mains, cheveux, vêtements lâches et outils des organes mobiles.
- Remettre en place les panneaux ou les dipositifs de protection et fermer les portes à la fin des travaux d’entretien et avant de faire démarrer le moteur.
- Avant d’intervenir, déposer les bougies ou injecteurs pour éviter la mise en route accidentelle du moteur.
- Bloquer le volant moteur pour éviter sa rotation lors d’une intervention sur le générateur.



### LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT CHAUD peuvent provoquer des brûlures.

- Il est préférable de vérifier le liquide de refroidissement une fois le moteur refroidi pour éviter de se brûler.
- Toujours vérifier le niveau de liquide de refroidissement dans le vase d’expansion (si présent), et non dans le radiateur (sauf si précisé autrement dans la section maintenance du manuel du moteur).
- Si le moteur est chaud et que le liquide doit être vérifié, opérer comme suivant :
- Mettre des lunettes de sécurité et des gants, placer un torchon sur le bouchon du radiateur.
- Dévisser le bouchon légèrement et laisser la vapeur s’échapper avant d’enlever le bouchon.



### LA CHALEUR DU MOTEUR peut provoquer un incendie.

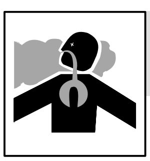
- Ne pas placer l’appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Tenir à distance les produits inflammables de l’échappement.



### LES ÉTINCELLES À L’ÉCHAPPEMENT peuvent provoquer un incendie.

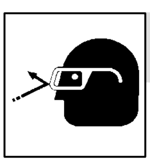
- Empêcher les étincelles d’échappement du moteur de provoquer un incendie.
- Utiliser uniquement un pare-étincelles approuvé − voir codes en vigueur.

## 2-4. Dangers liés à l’air comprimé



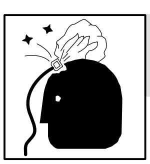
### RESPIRER L’AIR COMPRIMÉ peut provoquer des blessures graves ou causer la mort.

- Ne pas utiliser l’air comprimé pour respirer.
- Utiliser l’air comprimé seulement pour le coupage, gougeage et les outils pneumatiques.



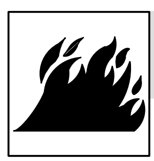
### L’AIR COMPRIMÉ peut provoquer des blessures.

- Porter des lunettes de sécurité approuvées.
- Ne pas diriger le jet d’air vers d’autres ou soi−même.



### L’AIR COMPRIME EMMAGASINE ET DES TUYAUX SOUS PRESSION peuvent provoquer des blessures.

- Relâcher la pression d’air de l’outillage ou du système avant d’effectuer la maintenance, avant de changer ou de rajouter des éléments ou avant d’ouvrir la purge ou le bouchon de remplissage d’huile.



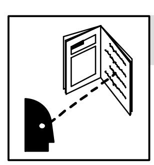
### Le METAL CHAUD lors du coupage et gougeage plasma peut provoquer un incendie ou une explosion.

- Ne pas couper ou gouger à proximité de produits inflammables.
- Surveillez et garder un extincteur à proximité.



### DES PIECES CHAUDES peuvent provoquer des brûlures et blessures.

- Ne pas toucher le compresseur ou d’autres éléments du circuit air comprimé chauds.
- Laisser l’ensemble se refroidir avant de toucher ou d’effectuer la maintenance.



### LIRE LES INSTRUCTIONS.

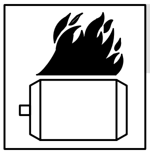
- Lisez le manuel d’instructions avant l’utilisation ou la maintenance de l’appareil.
- Arrêter le moteur et relâcher la pression avant d’effectuer la maintenance.

## 2-5. Dangers supplémentaires en relation avec l’installation, le fonctionnement et la maintenance



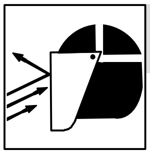
### LA CHUTE DE L’APPAREIL peut blesser.

- Utiliser l’anneau de levage uniquement pour soulever l’appareil lui-même ; sans chariot, de bouteilles de gaz, remorque, ou autres accessoires.
- Utiliser un équipement de levage de capacité suffisante pour lever l’appareil.
- En utilisant des fourches de levage pour déplacer l’unité, s’assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l’appareil.



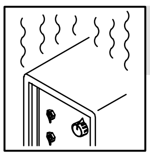
### LE SURCHAUFFEMENT peut endommager le moteur électrique.

- Arrêter ou déconnecter l'équipement avant de démarrer ou d'arrêter le moteur.
- Ne pas laisser tourner le moteur trop lentement sous risque d'endommager le moteur électrique à cause d'une tension et d'une fréquence trop faibles.
- Ne pas brancher de moteur de 50 ou de 60 Hz à la prise de 100 Hz, s'il y a lieu.



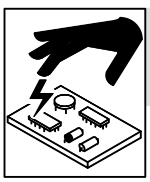
### LES ÉTINCELLES VOLANTES risquent de provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affuterr l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manoeuvre est à exécuter dans un endroit sûr lorsque l'on porte l'équipement homologué de protection du visage, des mains et du corps.
- Les étincelles risquent de causer un incendie − éloigner toute substance inflammable.



### L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Laisser l'équipement refroidir ; respecter le facteur de marche nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d'air du poste.



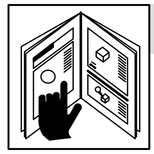
### LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimes.



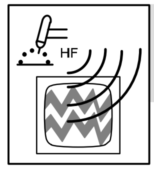
### UNE REMORQUE QUI BASCULE peut entraîner des blessures.

- Utiliser les supports de la remorque ou des blocs pour soutenir le poids.
- Installer convenablement le poste sur la remorque comme indiqué dans le manuel s'y rapportant.



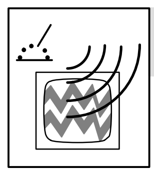
### LIRE LES INSTRUCTIONS.

- Utiliser seulement les pièces de rechange d'origine.
- Effectuer la maintenance du moteur et du compresseur (si applicable) suivant ce manuel et le manuel du moteur/compresseur (si applicable).




### LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio−navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et et un blindage pour réduire les interférences éventuelles.



### LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique risque de provoquer des interférences pour l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.

## 2-6. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, norme ANSI Z49.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126 (téléphone : (305) 443−9353, site Web : www.aws.org).
Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping, norme American Welding Society AWS F4.1, de l'American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126 (téléphone : (305) 443−9353, site Web : www.aws.org).
National Electrical Code, norme NFPA 70, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (téléphone : (617) 770−3000, sites Web : www.nfpa.org et www.sparky.org).
Safe Handling of Compressed Gases in Cylinders, brochure CGA P−1, de la Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202−4102 (téléphone : (703) 412−0900, site Web : www.cganet.com).
Code for Safety in Welding and Cutting, norme CSA W117.2, de la Canadian Standards Association, Standards Sales, 178 boulevard Rexdale, Rexdale (Ontario) Canada M9W 1R3 (téléphone : (800) 463−6727 ou à Toronto : (416) 747−4044, site Web : www.csa−international.org).
Practice For Occupational And Educational Eye And Face Protection, norme ANSI Z87.1, de l'American National Standards Institute, 11 West 42nd Street, New York, NY 10036−8002 (téléphone : (212) 642−4900, site Web : www.ansi.org).
Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, norme NFPA 51B, de la National Fire Protection Association, P.O. Box 9101, 1 Battery March Park, Quincy, MA 02269−9101 (téléphone : (617) 770−3000, site Web : www.nfpa.org et www.sparky.org).
OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, de l'U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250 (il y a 10 bureaux régionaux − Téléphone pour la Région 5, Chicago : (312) 353−2220, site Web : www.osha.gov).

## 2-7. Information sur les champs électromagnétiques

Données sur le soudage électrique et les effets des champs magnétiques basse fréquence sur l'organisme
En parcourant les câbles de soudage, le courant crée des champs électromagnétiques. Les effets potentiels de tels champs restent préoccupants. Cependant, après avoir examiné plus de 500 études qui ont été faites pendant une période de recherche de 17 ans, un comité de spécialistes du National Research Council a conclu : « L'accumulation de preuves n'a pas démontré que l'exposition aux champs magnétiques et aux champs électriques à haute fréquence constitue un risque pour la santé humaine ». Toutefois, les études et l'examen des preuves se poursuivent. En attendant les conclusions finales de la recherche, il serait souhaitable de réduire l'exposition aux champs électromagnétiques pendant le soudage ou le coupage.

Afin de réduire les champs électromagnétiques en milieu de travail, respecter les consignes suivantes :
1. Garder les câbles ensemble en les torsadant ou en les fixant avec du ruban adhésif.
2. Mettre tous les câbles du côté opposé à l'opérateur.
3. Ne pas s'enrouler les câbles autour du corps.
4. Garder le poste de soudage et les câbles le plus loin possible de soi.
5. Placer la pince de masse le plus près possible de la zone de soudage.

**Consignes relatives aux stimulateurs cardiaques :**
Les personnes qui portent un stimulateur cardiaque doivent avant tout consulter leur médecin. Si ce dernier les déclare aptes, il leur est recommandé de respecter les consignes ci-dessus.

# SECTION 3 − DEFINITIONS

## 3-1. Symbol Definitions

| Symbol | Definition | Symbol | Definition | Symbol | Definition | Symbol | Definition |
|---|---|---|---|---|---|---|---|
| | Stop Engine | | Fast (Run, Weld/Power) | | Fast/Slow (Run/Idle) | | Slow (Idle) |
| | Start Engine | | Panel/Local | | Temperature | | Fuel |
| | Engine Oil | | On | | Check Valve Clearance | | Battery (Engine) |
| | Engine | | Read Operator's Manual | A | Amperes | V | Volts |
| | MIG (GMAW), Wire | | Stick (SMAW) | | TIG (GTAW) | | Circuit Breaker |
| | Foot Control | | Manual Control | | Touch Start (GTAW) | | Pulsed |
| | Positive | | Negative | | Alternating Current (AC) | | Output |
| | Time | h | Hours | s | Seconds | | Protective Earth (Ground) |
| | Do not switch while welding | 14 | Remote 14 Receptacle | | Work Connection | | Glow Plug |
| | Wire Feed | + | Electrode Positive | − | Electrode Negative | | High Temperature |

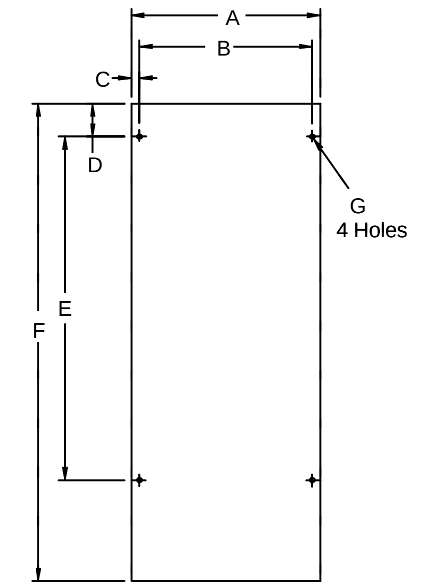
# SECTION 4 − SPECIFICATIONS

## 4-1. Weld, Power, And Engine Specifications

| Welding Mode | Rated Welding Output | Maximum Open-Circuit Voltage | Amperage Range In CC Mode | Voltage Range In CV Mode | Generator Power Rating | Fuel Capacity | Engine |
|---|---|---|---|---|---|---|---|
| CC/DC | 300 A, 32 V, 60% duty Cycle | 99 | 5 − 375 A | 10 − 34 V | Single-Phase, 12 kVA/kW 100/50 A, 120/240 V AC, 60 Hz | 13 gal (49 L) Tank | Kubota DH905 Water-Cooled, Three-Cylinder, Four-Cycle, 26 HP Diesel Engine |
| CV/DC | | | | | | | |

## 4-2. Dimensions, Weights, and Operating Angles

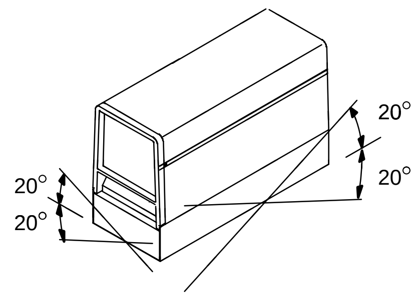
| Dimensions | |
|---|---|
| Height | 36 in (914 mm) |
| Width | 24 in (610 mm) |
| Depth | 59 in (1499 mm) |
| A | 23-5/8 in (600 mm) |
| B | 21-1/2 in (546 mm) |
| C | 1 in (25 mm) |
| D | 15-5/8 in (397 mm) |
| E | 26-3/8 in (679 mm) |
| F | 58-3/4 in (1492 mm) |
| G | 13/32 in (10 mm) Dia. |
| **Weight** | |
| 925 lb (420 kg) | |





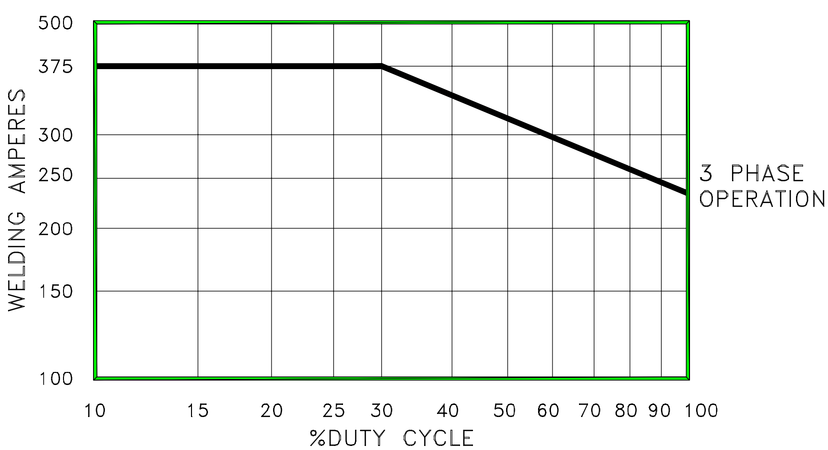

▲ **Do not exceed tilt angles or engine could be damaged or unit could tip.**

▲ **Do not move or operate unit where it could tip.**




## 4-3. Duty Cycle And Overheating



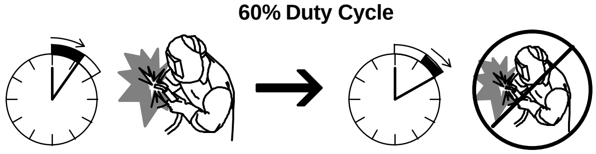



Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, output stops, a Help message is displayed (see Section 8-10), and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

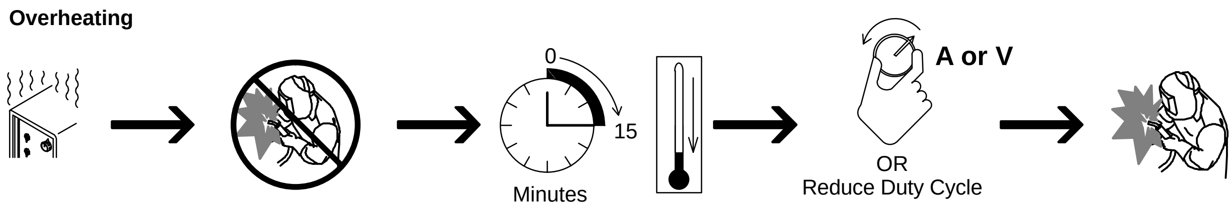
▲ **Exceeding duty cycle can damage unit and void warranty.**

**60% Duty Cycle**



6 Minutes Welding 4 Minutes Resting

**Overheating**

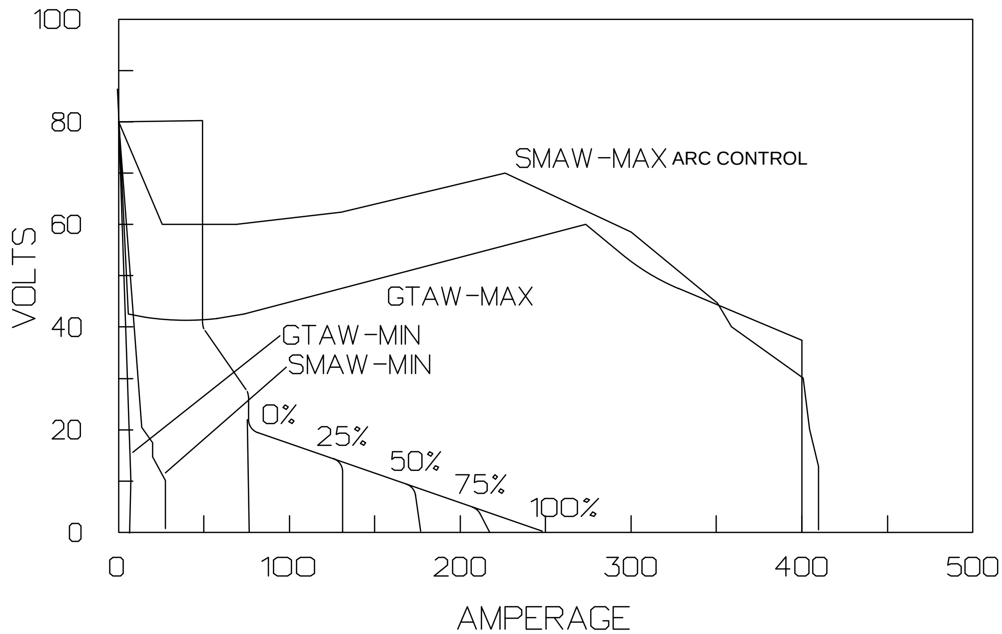



sduty1 5/95 / 196 698

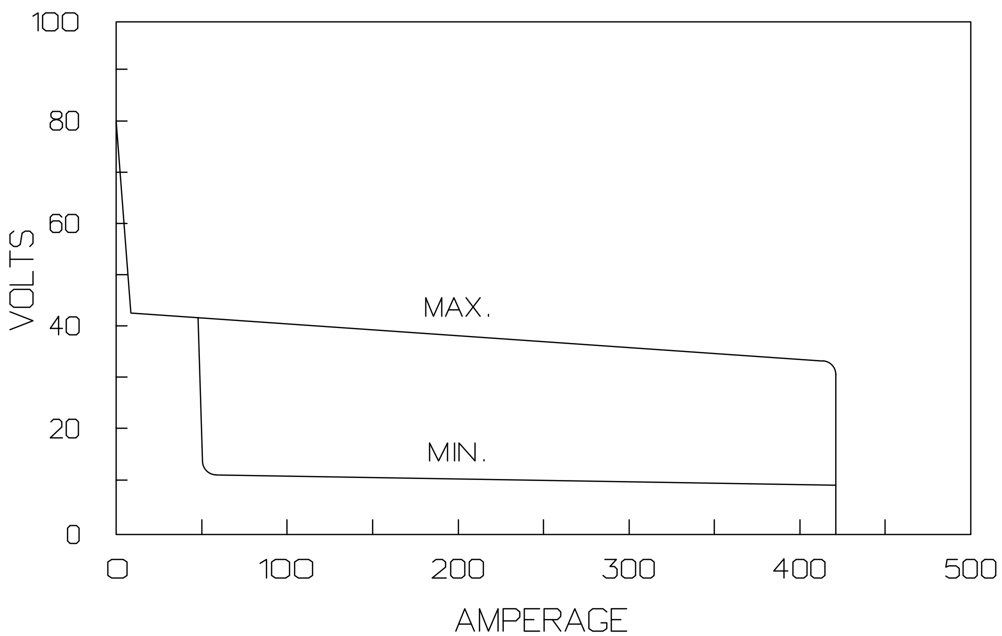
## 4-4. Volt-Ampere Curves

Volt-ampere curves show minimum and maximum voltage and amperage output capabilities of unit. Curves of other settings fall between curves shown.

### A. CC Mode

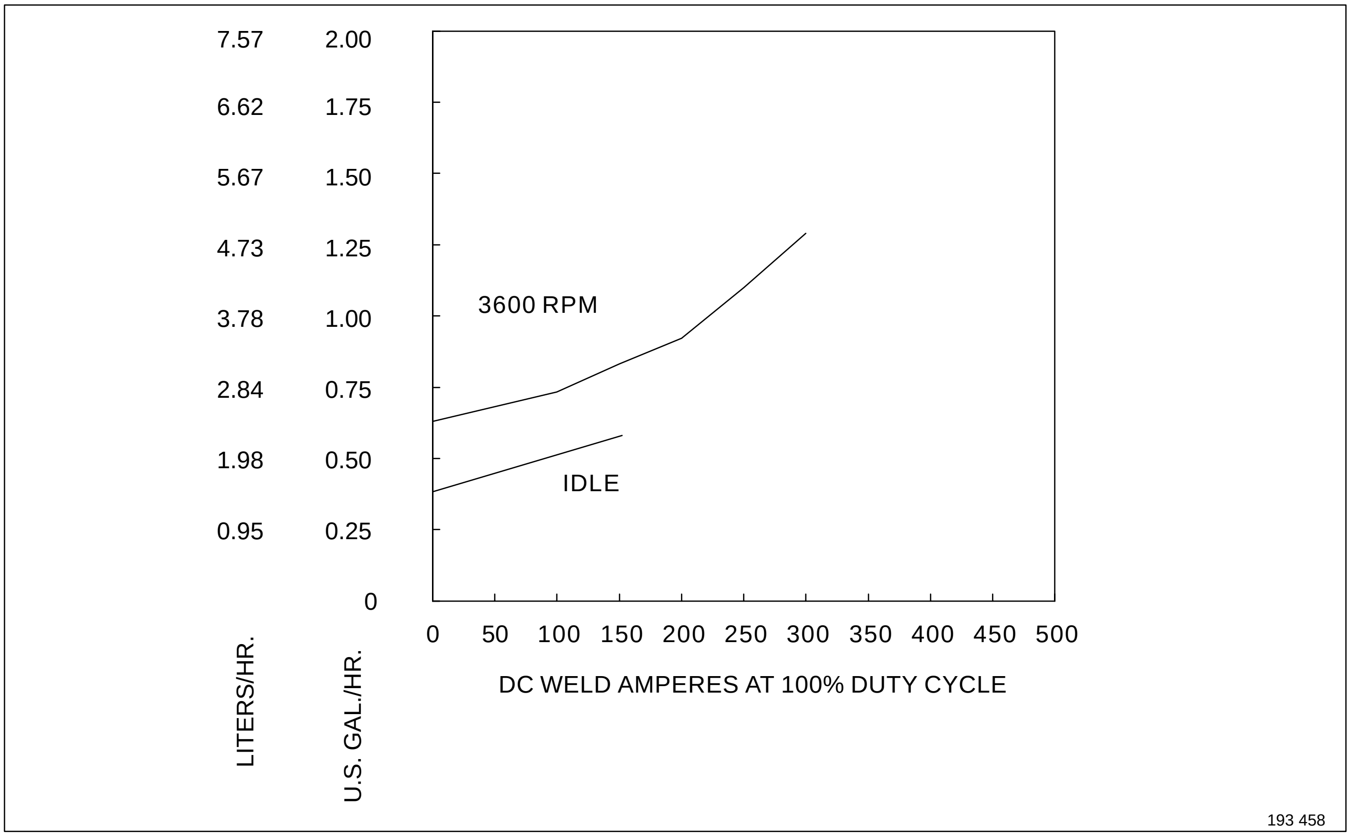



### B. CV Mode

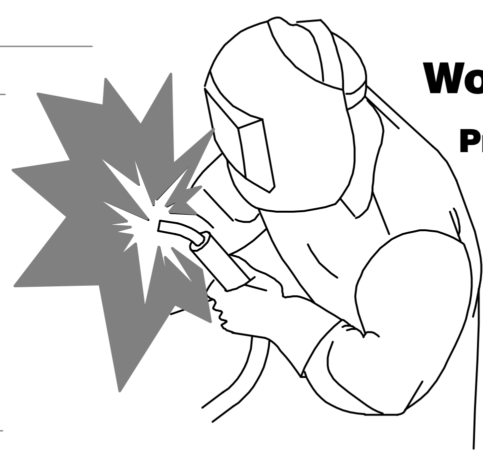



178 652 / 178 653

## 4-5. Fuel Consumption




# Notes

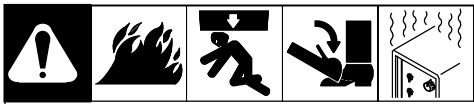


**Work like a Pro!**

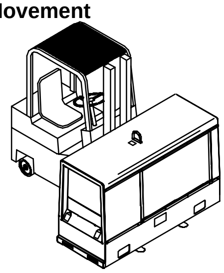
**Pros weld and cut safely. Read the safety rules at the beginning of this manual.**

# SECTION 5 − INSTALLATION

## 5-1. Installing Welding Generator

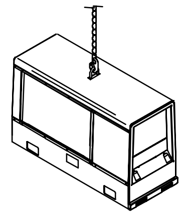


**Movement**

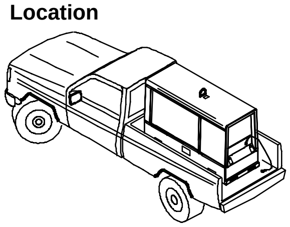


▲ **Do not lift unit from end.**

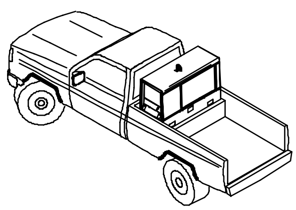
OR



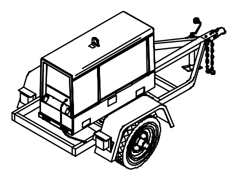
**Location**



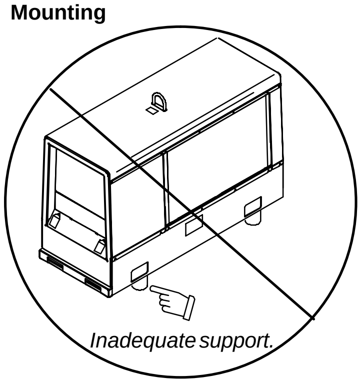
OR

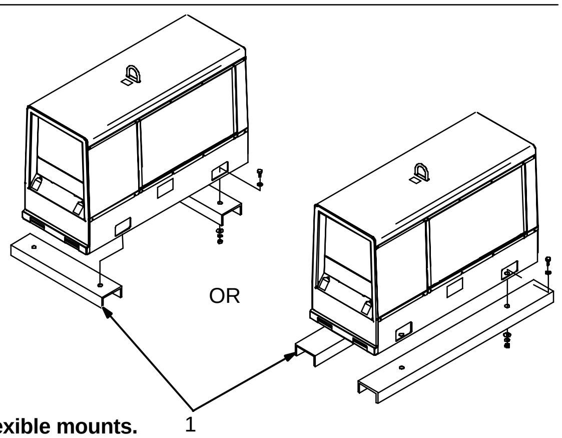


OR



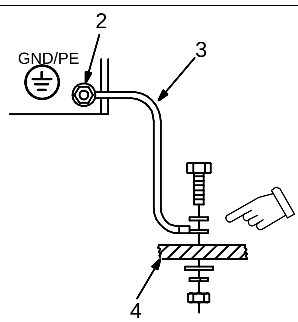
**Mounting**




▲ **Do not use flexible mounts.**

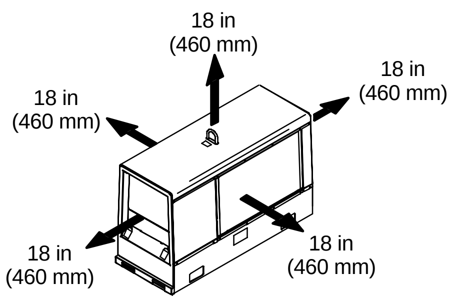
**Grounding**




*Electrically bond generator frame to vehicle frame by metal-to-metal contact.*

▲ **Bed liners, shipping skids, and some running gears insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.**

**Airflow Clearance**




▲ **Do not weld on base. Welding on base can cause fuel tank fire or explosion. Bolt unit down using holes provided in base.**

▲ **Always securely fasten welding generator onto transport vehicle or trailer and comply with all DOT and other applicable codes.**

▲ **Do not mount unit by supporting the base <u>only</u> at the four mounting holes. Use cross-supports to adequately support unit and prevent damage to base.**

▲ **Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.**

▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

**Mounting:**

1 Cross-Supports

Mount unit on flat surface or use cross-supports to support base.

**Grounding:**

2 Equipment Grounding Terminal (On Front Panel)

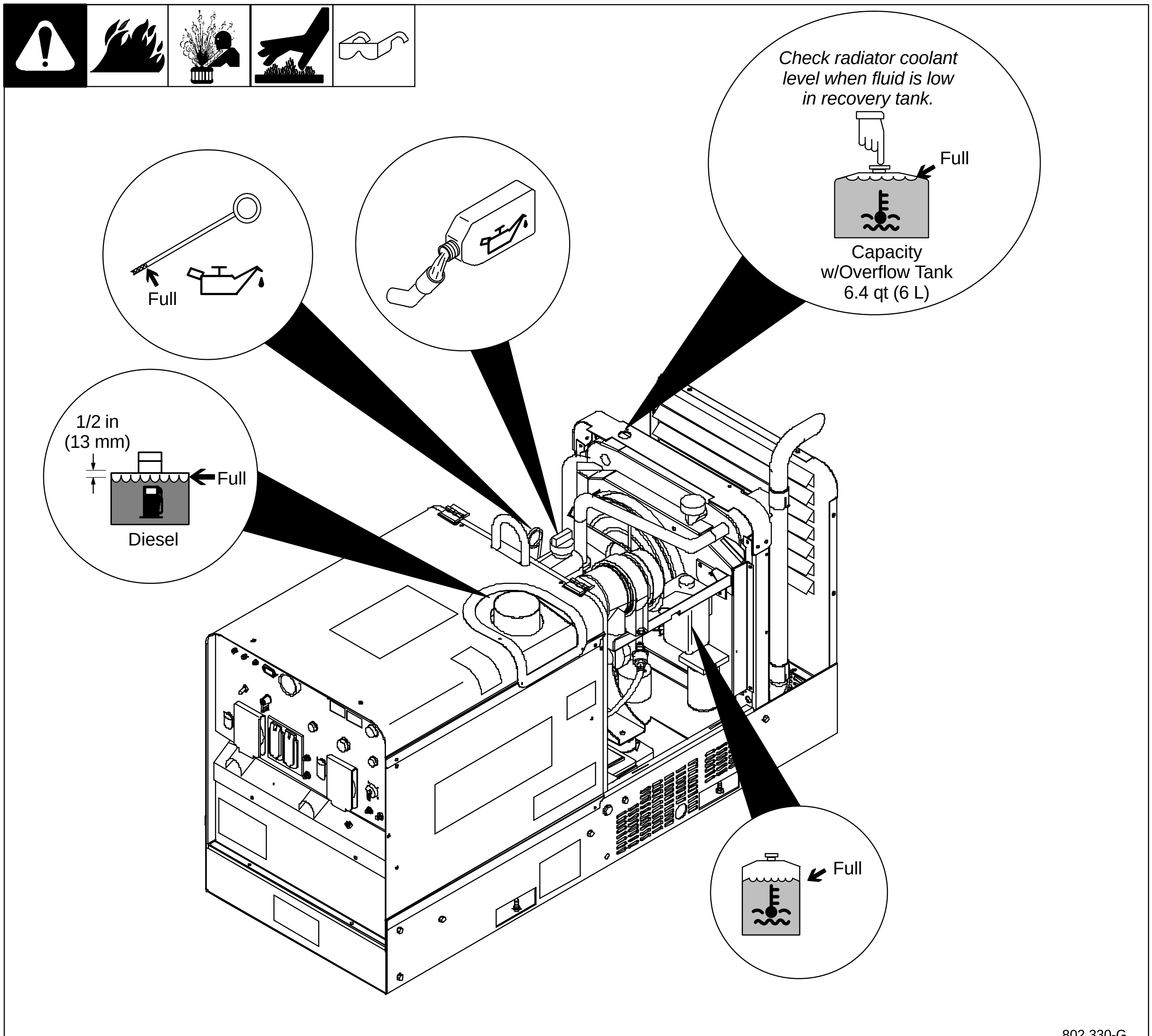
3 Grounding Cable (Not Supplied)

4 Metal Vehicle Frame

Connect cable from equipment ground terminal to metal vehicle frame. Use #10 AWG or larger insulated copper wire.

install2 5/03 − Ref. 800 652 / Ref. 800 477-A / 803 274

## 5-2. Engine Prestart Checks




Check all fluids daily. Engine must be cold and on a level surface. Unit is shipped with 10W30 engine oil.

Engine stops if oil pressure is too low or engine temperature is too high.

☞ *This unit has a low oil pressure shutdown switch. However, some conditions may cause engine damage before the engine shuts down. Check oil level often and do not use the oil pressure shutdown system to monitor oil level.*

Follow run-in procedure in engine manual. If unburned fuel and oil collect in exhaust pipe during run-in, see Section 10.

**Fuel**

▲ **Do not use gasoline. Gasoline will damage engine.**

Add fresh diesel fuel before starting engine the first time (see maintenance label for specifications). Fill fuel tank up to 1/2 in. (13 mm) from top to allow room for expansion.

Do not run out of fuel or air enters fuel system and causes starting problems. See engine manual to bleed air from fuel system.

**Oil**

After fueling, check oil with unit on level surface. If oil is not up to full mark on dipstick, add oil (see maintenance label).

▲ **Engine may use oil and wetstacking may occur during run-in period. Check oil several times daily during run-in.**

**Coolant**

Check coolant level in recovery tank before starting unit the first time. Add coolant if coolant is below bottom of radiator filler neck (see Section 5-3 for radiator filling instructions.

Check coolant in recovery tank daily. If coolant is below Full level, add coolant until coolant level in tank is between Full and Low levels. If recovery tank coolant level was low, also check coolant level in radiator (see Section 5-3).

Engine coolant is a mixture of water and ethylene glycol base antifreeze. A solution of 50% antifreeze and 50% water must be used in this engine. Do not use 100% antifreeze or severe damage will occur.

Keep radiator and air intake clean and free of dirt.

▲ **Incorrect engine temperature can damage engine. Do not run engine without a properly working thermostat and radiator cap.**

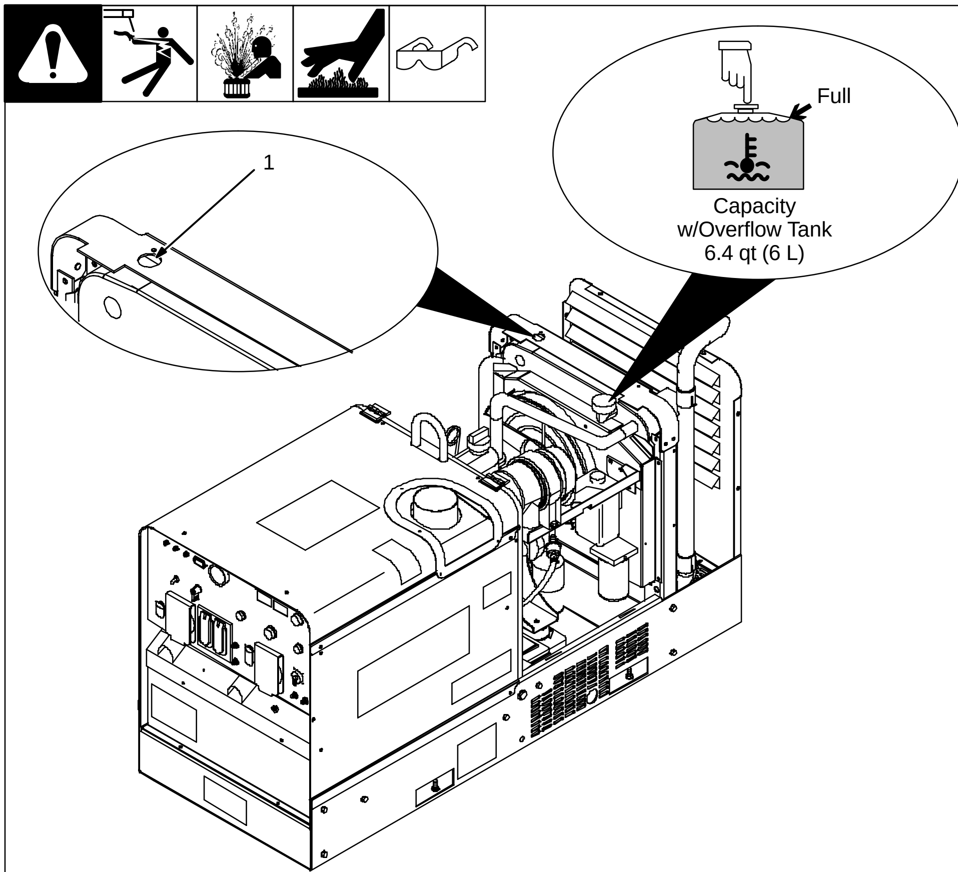
☞ *To improve cold weather starting:*

*Keep battery in good condition. Store battery in warm area.*

*Use fuel formulated for cold weather (diesel fuel can gel in cold weather). Contact local fuel supplier for fuel information.*

*Use correct grade oil for cold weather operation (see Section 6-6).*

## 5-3. Adding Coolant To Radiator




▲ **Stop engine and let cool.**

☞ *Check coolant level according to Section 5-2 before starting this procedure.*

If coolant level is below bottom of radiator filler neck, add coolant as follows:

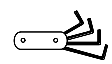
1 Radiator Air Bleed Screw

Remove radiator air bleed screw. Add coolant to radiator until coolant is at bottom of filler neck. This ensures all air is purged from the system.

Reinstall screw and radiator cap. Check coolant level in recovery tank (see Section 5-2).

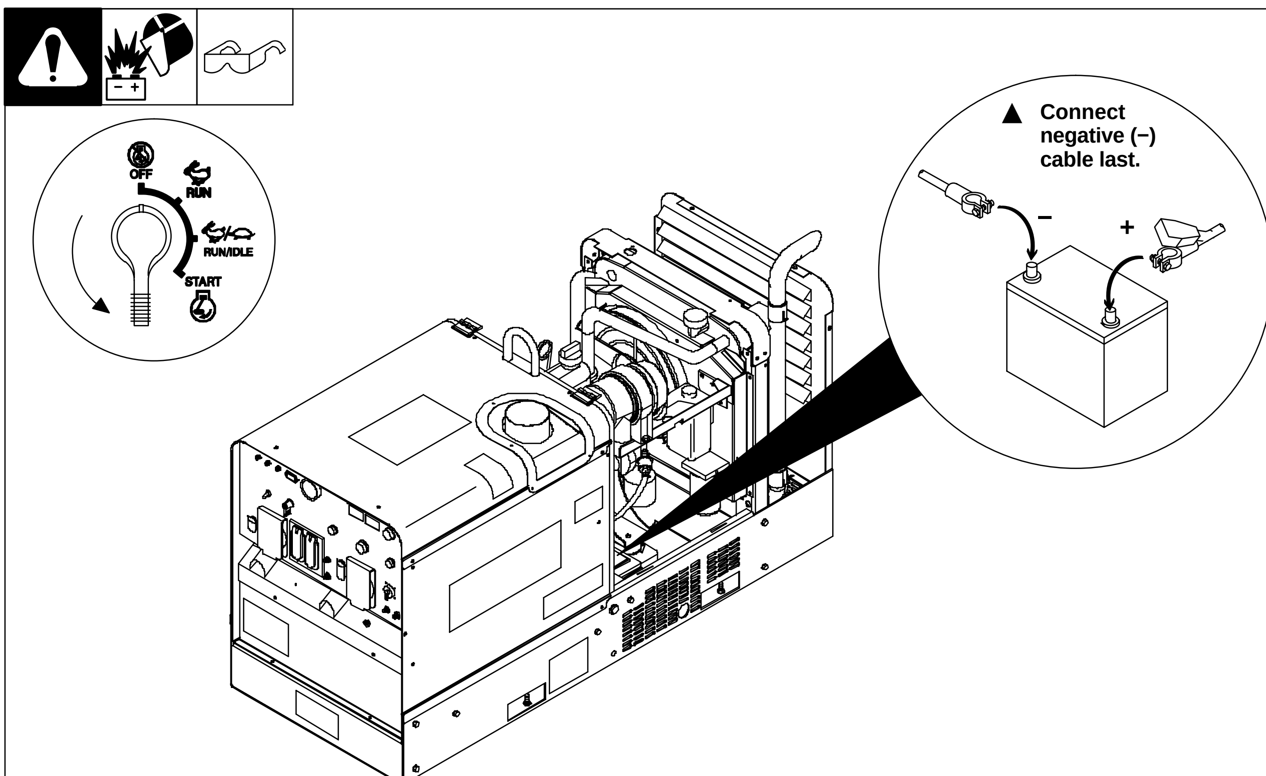
Engine coolant is a mixture of water and ethylene glycol base antifreeze. A solution of 50% antifreeze and 50% water must be used in this engine. Do not use 100% antifreeze or severe damage will occur.

Tools Needed:

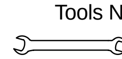


Ref. 802 330-G

## 5-4. Connecting The Battery




Tools Needed:

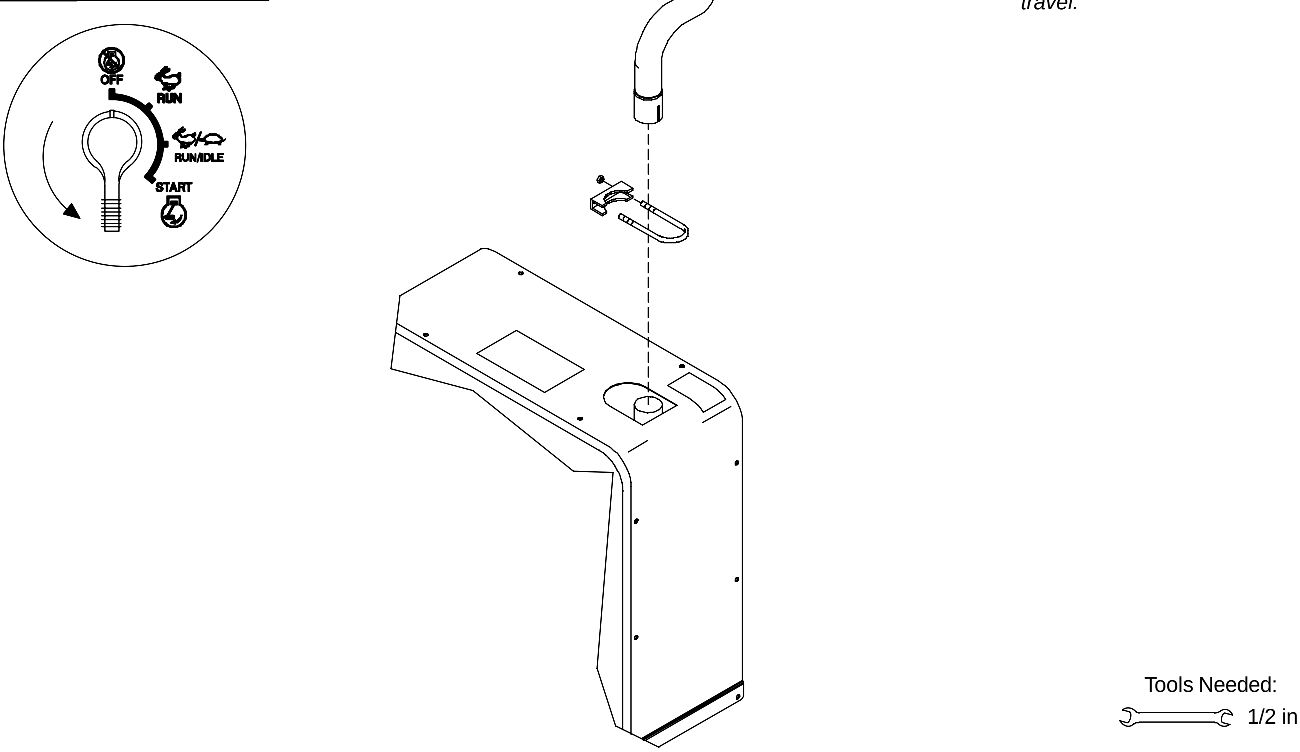
 3/8, 1/2 in

Ref. 213 263-B / 802 330-G / Ref. S-0756-D

## 5-5. Installing Exhaust Pipe

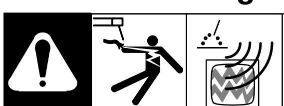


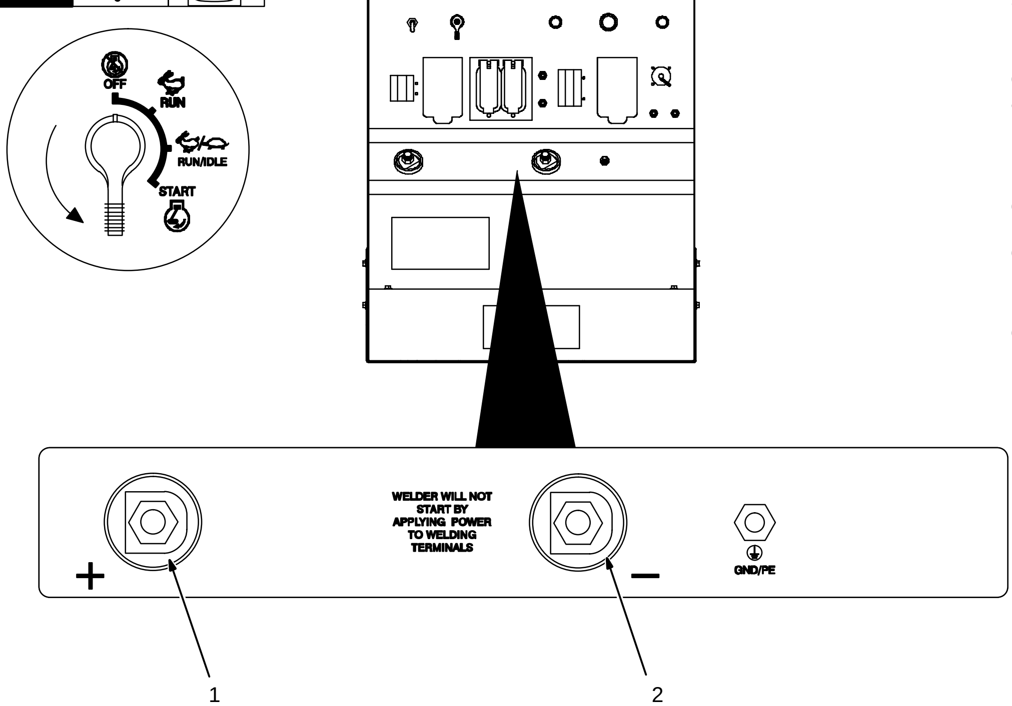
☞ *Point exhaust pipe in desired direction but always away from front panel and direction of travel.*




802 173-B / Ref. 213 263-B

## 5-6. Connecting To Weld Output Terminals






1 Positive (+) Weld Output Terminal

2 Negative (−) Weld Output Terminal

For MIG welding, connect work cable to Negative (−) terminal and wire feeder cable to Positive (+) terminal.

For Stick/TIG welding Direct Current Electrode Positive (DCEP), connect work cable to Negative (−) terminal and electrode holder cable to Positive (+) terminal.

For Direct Current Electrode Negative (DCEN), reverse cable connections.

801 941 / Ref. 213 263-B / 802 174-E

## 5-7. Selecting Weld Cable Sizes*



**Weld Output Terminals**

▲ Turn off power before connecting to weld output terminals.

▲ Do not use worn, damaged, undersized, or poorly spliced cables.

| Welding Amperes | Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding*** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 100 ft (30 m) or Less | | 150 ft (45 m) | 200 ft (60 m) | 250 ft (70 m) | 300 ft (90 m) | 350 ft (105 m) | 400 ft (120 m) |
| | 10 – 60% Duty Cycle | 60 – 100% Duty Cycle | 10 – 100% Duty Cycle | | | | | |
| 100 | 4 (20) | 4 (20) | 4 (20) | 3 (30) | 2 (35) | 1 (50) | 1/0 (60) | 1/0 (60) |
| 150 | 3 (30) | 3 (30) | 2 (35) | 1 (50) | 1/0 (60) | 2/0 (70) | 3/0 (95) | 3/0 (95) |
| 200 | 3 (30) | 2 (35) | 1 (50) | 1/0 (60) | 2/0 (70) | 3/0 (95) | 4/0 (120) | 4/0 (120) |
| 250 | 2 (35) | 1 (50) | 1/0 (60) | 2/0 (70) | 3/0 (95) | 4/0 (120) | 2 ea. 2/0 (2x70) | 2 ea. 2/0 (2x70) |
| 300 | 1 (50) | 1/0 (60) | 2/0 (70) | 3/0 (95) | 4/0 (120) | 2 ea. 2/0 (2x70) | 2 ea. 3/0 (2x95) | 2 ea. 3/0 (2x95) |
| 350 | 1/0 (60) | 2/0 (70) | 3/0 (95) | 4/0 (120) | 2 ea. 2/0 (2x70) | 2 ea. 3/0 (2x95) | 2 ea. 3/0 (2x95) | 2 ea. 4/0 (2x120) |

* This chart is a general guideline and may not suit all applications. If cable(s) overheat (normally you can smell it), use next size larger cable.

**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.
( ) = mm$^2$ for metric use

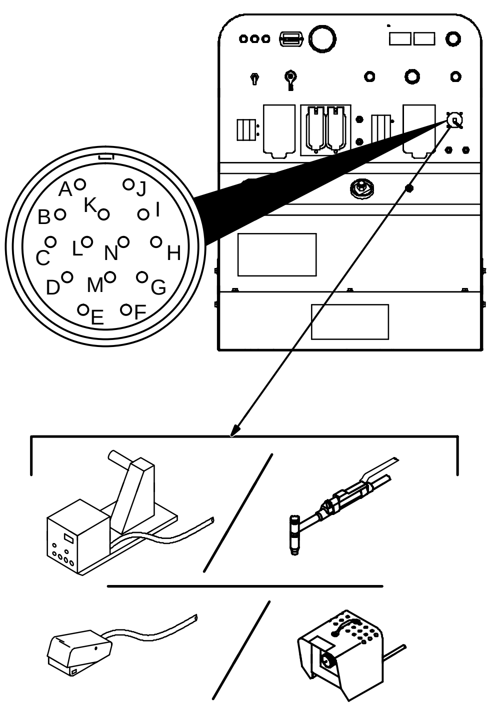
S-0007-E–

***For distances longer than those shown in this guide, call a factory applications representative at 920-735-4505.

## 5-8. Remote 14 Receptacle RC14 Information

**NOTE**

*Engine runs at weld/power speed whenever a device connected to the remote 14 receptacle is running.*



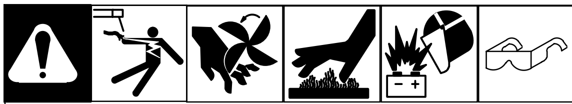

802 174-G

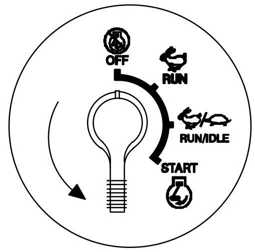
| REMOTE 14 | Socket* | Socket Information |
|---|---|---|
| 24 VOLTS AC OUTPUT (CONTACTOR) | A | 24 volts ac. Protected by circuit breaker CB6. |
| | B | Contact closure to A completes 24 volts ac contactor control circuit. |
| 115 VOLTS AC OUTPUT (CONTACTOR) | I | 115 volts ac. Protected by circuit breaker CB5. |
| | J | Contact closure to I completes 115 volts ac contactor control circuit. |
| REMOTE OUTPUT CONTROL | C | Output to remote control; 0 to +10 volts dc, +10 volts dc in MIG mode. |
| | D | Remote control circuit common. |
| | E | 0 to +10 volts dc input command signal from remote control. |
| | M | CC/CV select. |
| A/V AMPERAGE VOLTAGE | F | Current feedback; +1 volt dc per 100 amperes. |
| | H | Voltage feedback; +1 volt dc per 10 output receptacle volts. |
| GND | G | Circuit common for 24 and 115 volts ac circuits. |
| | K | Chassis common. |

*The remaining sockets are not used.

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## 5-9. Guidelines For Installing Customer-Supplied Emergency Air Shutdown Valve






A customer-supplied emergency air shutdown valve can be installed to stop the engine immediately in emergency situations.

These guidelines show the typical installation of a Gator ESD 175-275-L3 air shutdown valve. Installation of other air shutdown valves may differ from that shown. Contact the air shutdown valve manufacturer or a Factory Authorized Service Agent for additional installation and operation information.

▲ **Stop engine, and let cool.**

▲ **Disconnect battery negative (−) cable.**

Open doors and remove side panels.

1 Air Cleaner

2 2 in (51 mm) Hose Clamp

3 1-3/4 x 2 in (44 x 51 mm) Rubber Hose

4 Air Shutdown Valve (Gator ESD 175-275-L3)

5 1-3/4 x 16-1/2 in (44 x 419 mm) Flexible Radiator Hose (NAPA Part No. FM68)

☞ *Use thick-walled rubber hose. Do not use heater hose. (Heater hose could let dirt into engine.)*

6 Engine Air Inlet

7 Shutdown Control

8 42 in (1067 mm) Shutdown Control Cable (Supplied By Gator)

9 Shutdown Valve Reset Lever

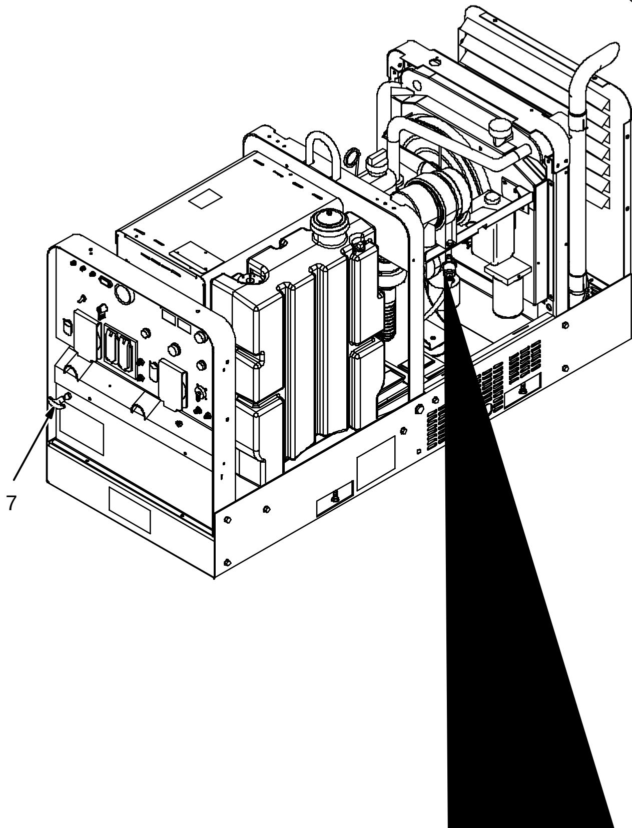
Install components as shown.

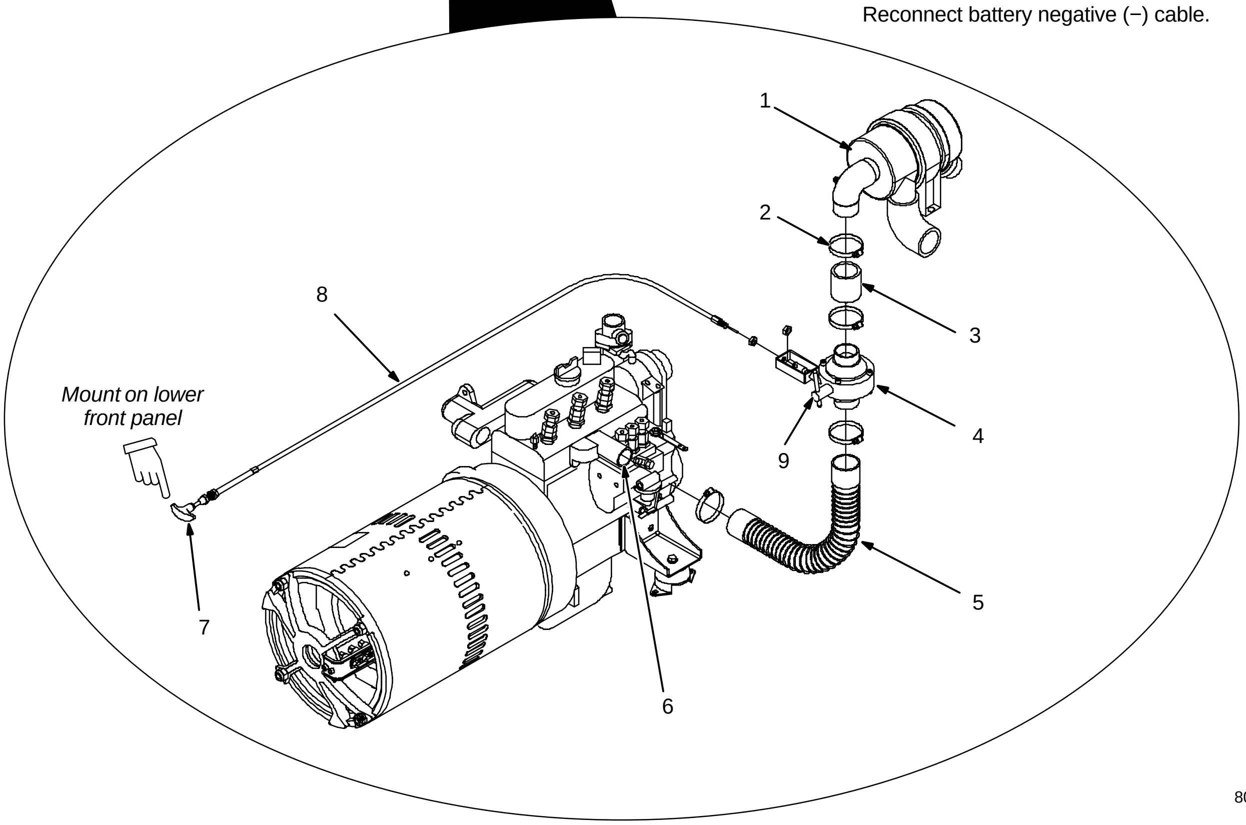
Be sure air shutdown valve is installed with air flow arrow pointing toward air inlet. Use cable ties to keep air shutdown system components away from hot or moving parts.

Verify the emergency air shutdown system operates correctly. After testing, use reset lever to reset air shutdown valve.

Reinstall side panels and close doors.

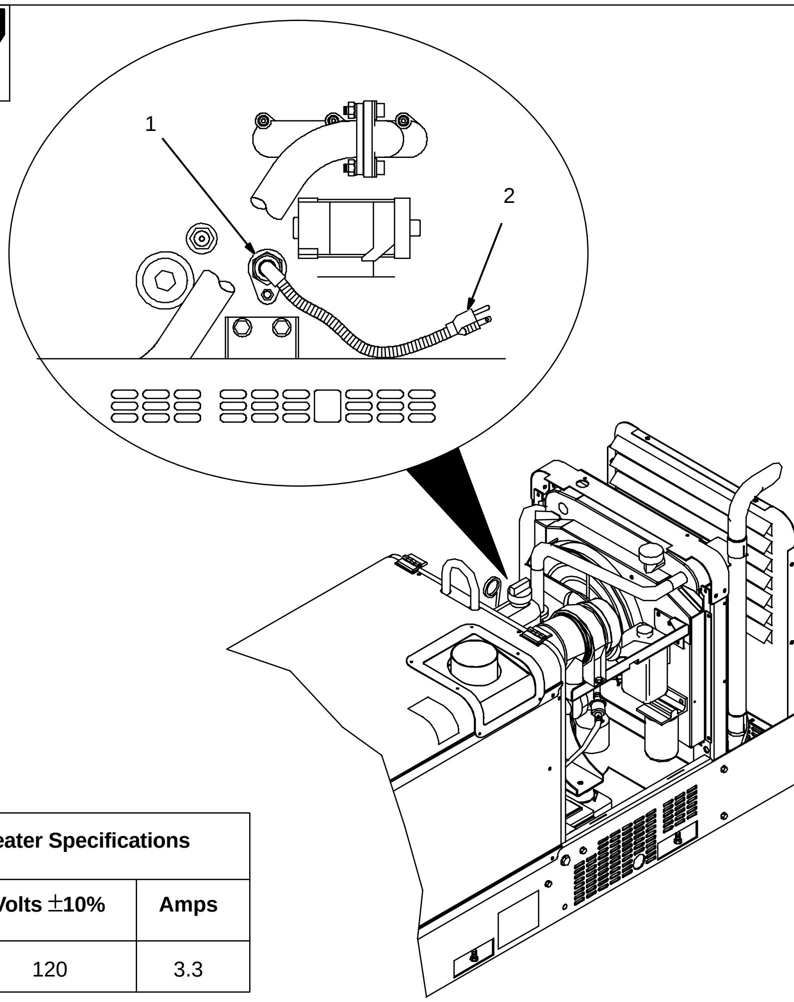
Reconnect battery negative (−) cable.




803 390

## 5-10. Operating Engine Block Heater




▲ **Do not run engine while coolant heater is on.**

▲ **Do not touch hot engine block. Engine block gets hot near heater.**

1 Coolant Heater

2 Heater Plug

Use heater to maintain a constant engine coolant temperature. See table for heater specifications.

To turn on heater, connect heater plug to a 120 volt ac grounded receptacle.

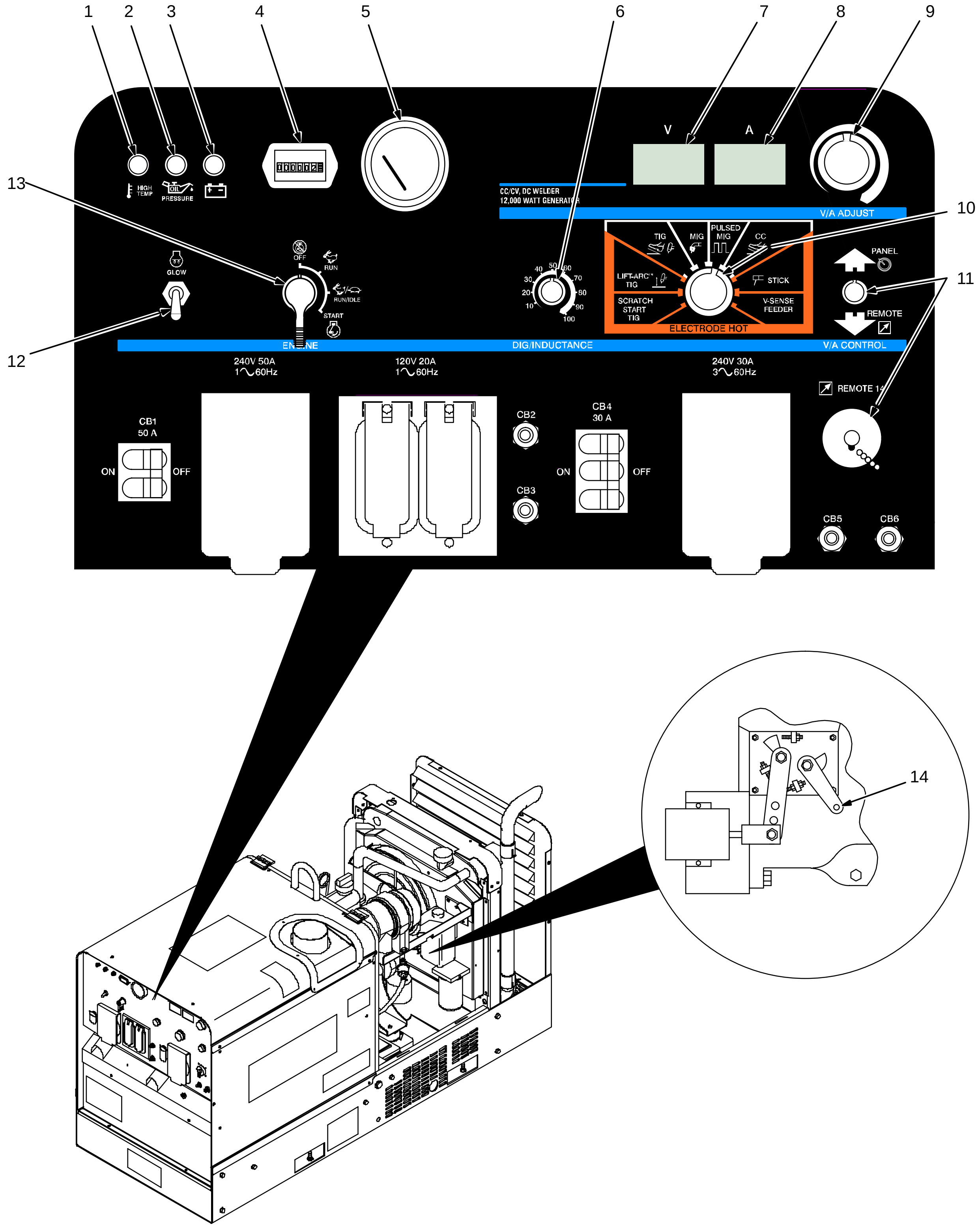
To turn off heater, disconnect plug.

| **Coolant Heater Specifications** | | |
|---|---|---|
| **Watts** | **Volts ±10%** | **Amps** |
| 400 | 120 | 3.3 |

Ref. 802 330 / 803 393

# Notes

## 6-1. Controls (See Section 6-2)

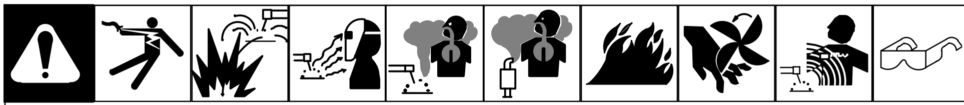



Ref. 213 263-B / 802 330-G



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## 6-2. Description Of Controls (See Section 6-1)



☞ *The fan motor is thermostatically controlled and only runs when cooling is needed.*

**Engine Lights**

1 Engine Temperature Light

Light goes on and engine stops if engine temperature is too high.

▲ **Stop engine and fix trouble if Engine Temperature light goes on.**

2 Engine Oil Pressure Light

Light goes on and engine stops if oil pressure is too low. Light goes on momentarily during start-up but goes out when engine reaches normal oil pressure.

▲ **Stop engine and fix trouble if Engine Oil Pressure light stays on after start-up.**

3 Battery Charging Light

Light goes on if engine alternator is not charging battery. Engine continues to run.

▲ **Stop engine and fix trouble if Battery Charging light goes on.**

**Engine Gauges**

4 Engine Hour Meter

Use hour meter to help schedule routine maintenance.

5 Fuel Gauge

**Weld Controls**

6 Dig/Inductance Control

Control adjusts Dig when Stick mode is selected on mode switch. When control is set toward minimum, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When set toward maximum, short-circuit amperage is increased at low arc voltage to assist with arc starts and help prevent the electrode from sticking while welding (see volt-ampere curves in Section 4-4).

Select setting best suited for application.

Control adjusts inductance when MIG or V-Sense Feeder position is selected on the mode switch. Inductance determines the "wetness" of the weld puddle. When set toward maximum, "wetness" (puddle fluidity) increases.

Control is not functional when Pulsed MIG or one of the TIG modes is selected.

7 Voltmeter

Meter displays weld voltage and help messages (see Sections 6-3 and 8-10).

8 Ammeter

Meter displays weld amperage and help messages (see Sections 6-3 and 8-10).

9 V/A (Voltage/Amperage) Adjustment Control

10 Mode Switch

The Mode switch setting determines both the process and output On/Off control (see Section 6-4). Source of control (panel or remote) for the amount of output is selected by the V/A Control switch.

For Air Carbon Arc (CAC-A) cutting and gouging, place switch in Stick position. For best results, place Dig/Inductance control in the maximum position.

11 V/A (Voltage/Amperage) Control Switch And Remote 14 Receptacle

For front panel control, place switch in Panel position and use the V/A Adjustment control.

For remote control, make connections to Remote 14 receptacle (see Section 5-8), and place switch in Remote position. In most modes, remote control is a percent of V/A Adjustment control setting (value selected on V/A Adjustment control is maximum available on remote). In the MIG mode, remote control provides full range of unit output regardless of V/A Adjust control setting.

**Engine Starting Controls**

12 Glow Plug Switch

Use switch to energize glow plugs for cold weather starting. Glow plugs warm in about six seconds and engine can be started (see starting instructions following).

▲ **Do not use glow plug longer than 20 seconds.**

13 Engine Control Switch

Use switch to start engine, select speed, and stop engine. In Run/Idle position, engine runs at idle speed at no load, and weld/power speed under load. In Run position, engine runs at weld/power speed.

**To Start**:

▲ **Do not use ether as a starting aid. Using ether voids warranty.**

**Above 32° F:** turn Engine Control switch to Start. Release switch when engine starts and Engine Oil Pressure light goes out.

☞ *If engine does not start, let engine come to a complete stop before attempting restart.*

**Below 32° F:** turn engine control switch to Run/Idle position. Push Glow Plug switch up and hold about six seconds. Turn Engine Control switch to Start. Release switch when engine starts and Engine Oil Pressure light goes out.

See Section 6-6 for additional information on cold weather operation.

☞ *If engine does not start, let engine come to a complete stop before attempting restart.*

**To Stop**: turn Engine Control switch to Off position.

☞ *Push engine stop lever to stop engine if Engine Control switch does not work (see item 14).*

14 Engine Stop Lever

Use lever to stop engine if Engine Control switch does not work.

## 6-3. Meter Functions

**NOTE** ☞ *The meters display the actual weld output values for approximately three seconds after the arc is broken.*

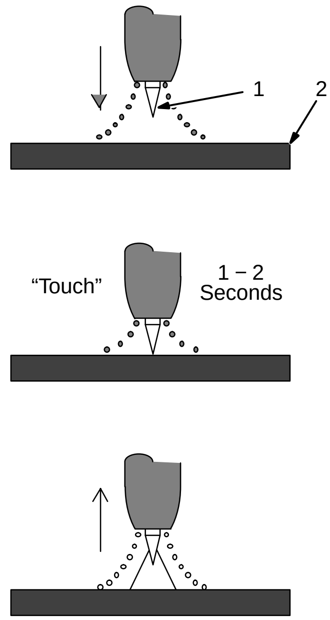
| Mode | Meter Reading At Idle | | Meter Reading While Welding | |
|---|---|---|---|---|
| | V | A | V | A |
| Scratch Start TIG | 80.0 Actual Volts (OCV) | 85 Preset Amps | 10.3 Actual Volts | 85 Actual Amps |
| Lift-Arc TIG | 7.0 Actual Volts | 85 Preset Amps | 10.3 Actual Volts | 85 Actual Amps |
| TIG | Blank | 85 Preset Amps | 10.3 Actual Volts | 85 Actual Amps |
| MIG | 24.5 Preset Volts | Blank | 24.5 Actual Volts | 250 Actual Amps |
| Pulsed MIG | PPP Pulse Display | PPP Pulse Display | 24.5 Actual Volts | 250 Actual Amps |
| CC | Blank | 85 Preset Amps | 24.5 Actual Volts | 85 Actual Amps |
| Stick | 80.0 Actual Volts (OCV) | 85 Preset Amps | 24.5 Actual Volts | 85 Actual Amps |
| V-Sense Feeder | 80.0 Flashes OCV And Preset | Blank | 24.5 Actual Volts | 250 Actual Amps |

## 6-4. Mode Switch Settings

**NOTE** ☞ *The Stick and CC modes provide the* Adaptive Hot Start™ *feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.*

| Mode Switch Setting | Process | Output On/Off Control |
|---|---|---|
| Scratch Start TIG | GTAW | Electrode Hot |
| Lift-Arc TIG | GTAW − See Section 6-5 | Electrode Hot |
| TIG | GTAW With HF Unit, Pulsing Device, Or Remote Control | At Remote 14 |
| MIG | GMAW | At Remote 14 |
| Pulsed MIG | GMAW-P (Requires an external pulsing device.) | At Remote 14 |
| CC | Stick (SMAW) With Remote On/Off | At Remote 14 |
| Stick | SMAW | Electrode Hot |
| V-Sense Feeder | MIG (GMAW) With Voltage Sensing Wire Feeder | Electrode Hot |

## 6-5. Lift-Arc TIG Procedure




Do NOT Strike Like A Match!

With Mode Switch in the Lift-Arc TIG position, start an arc as follows:

1 TIG Electrode

2 Workpiece

Touch tungsten electrode to workpiece at weld start point, **hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. An arc will form when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

Ref. S-156 279

## 6-6. Recommendations For Extreme Cold Weather Operation

☞ *For more information on operating in cold weather, contact the nearest Factory Authorized Service Agent or Kubota Service Center.*

**Fuel**

- Use an arctic-grade diesel fuel and keep fuel tank at least half full to prevent fuel lines from draining back into tank.
- Do not use gasoline or kerosene.
- Do not use fuel additives.

**Oil**

- Use 10W30 oil when operating at ambient temperatures above -4° F (−20° C).
- Use 5W30 oil when operating at ambient temperatures above -13° F (−25° C).
- Operating at extremely low temperatures thickens engine oil and reduces cranking speed. Contact a Factory Authorized Service Agent or Kubota Service Center for information on using 0W20 oil in these conditions. Low temperature oil must be replaced as ambient operating temperatures increase.

**Coolant**

- Be sure the cooling system is completely filled with a 50/50 antifreeze/water mix (open the radiator vent when filling). Do not mix antifreeze and water solution in the overflow tank. Use a premixed 50/50 antifreeze/water solution to "top off" overflow tank. Use caution if rerouting cooling lines. **Engine damage due to lack of coolant or incorrect coolant mix is not covered by the warranty**.
- A 50/50 antifreeze/water mix protects engine to -34° F (−37° C). If operating at even lower temperatures, contact a Factory Authorized Service Agent or Kubota Service Center for coolant information.

**Battery**

- Replacement Battery Rating: 12 Volt, 535 CCA (minimum) 90 RSV Group 55.
- Check connections at battery, starter, and engine block. Inspect battery cables for abrasion and wear, and verify the battery is secured.
- Consider installing easily-accessible battery booster leads (0 or 00 AWG) to provide easy connection to a service truck's battery.
- Boost the starting capability of the battery by using a battery heater.

**Starting**

- **Do not use ether.**
- Use the engine block heater to maintain engine temperature above ambient temperature.
- Use the glow plugs for 20−30 seconds before starting. As a preseason check, make sure the glow plugs are working properly.
- Disconnect all unnecessary loads from generator ac receptacles when starting.

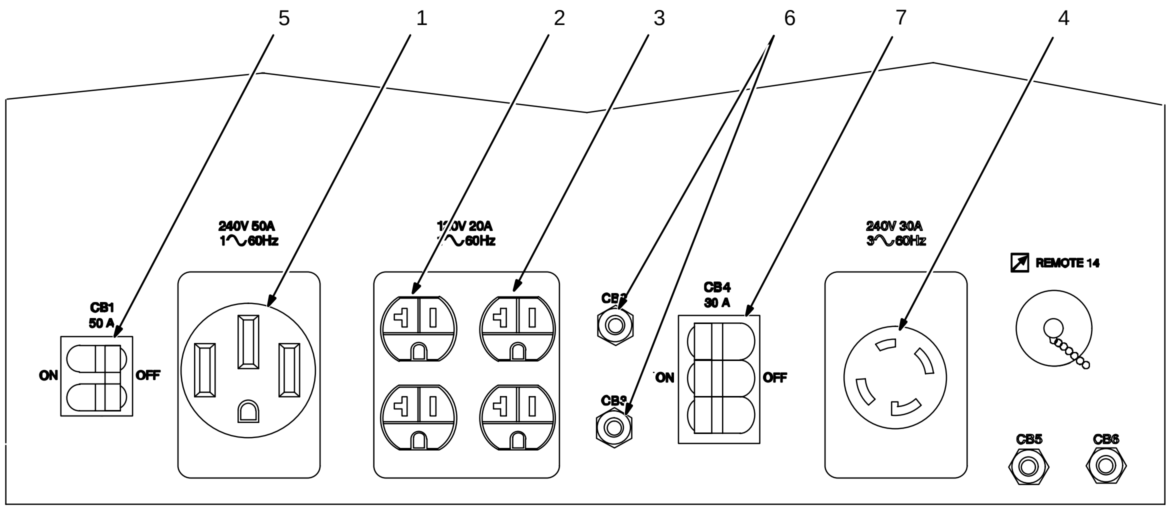
**Operating**

- To reduce crankcase condensation and breather tube freezing problems, allow engine to reach normal operating temperature as quickly as possible.
- Crankcase breather tubes will collect condensation and freeze if the hose is improperly routed. The breather tube should be free of sharp bends and kinks. A blocked breather tube will cause excessive crankcase pressure that will blow out the safety plug, oil seals, or dipstick. Contact a Factory Authorized Service Agent to obtain a shorter breather hose that is less likely to kink.
- Inspect the routing and condition of the breather tube frequently. Reroute or replace the hose if necessary.
- For continuous use in extreme cold, block the cooling holes in the base to reduce air flow through the radiator and achieve higher engine temperature. Close off the base inlet vents only if the engine coolant or oil temperatures can be monitored to ensure they remain within the specified limits.
- To obtain warmer air for combustion, turn the air cleaner inlet away from the inlet vents, and seal the inlet vents.
- If operating in cold weather all the time, consider replacing the existing radiator cooling fan with a smaller fan that draws less air through the radiator. Operation in warmer temperatures would require an additional "booster" electric fan to adequately cool the engine.

# SECTION 7 − OPERATING AUXILIARY EQUIPMENT

## 7-1. Generator Power Receptacles And Circuit Breakers






8

| SIMULTANEOUS WELDING AND AUXILIARY POWER | | | | |
|---|---|---|---|---|
| **Weld Current In Amperes** | **Total Power In Watts** | **120 V Receptacle Amperes** | **Single-Phase 240 V Receptacle Amperes** | **Three-Phase 240 V Receptacle Amperes** |
| 350 | 11900 | − | − | − |
| 300 | 9600 | 16 | 5 | 4 |
| 250 | 7500 | 38 | 15 | 10 |
| 200 | 5600 | 40 | 30 | 13 |
| 150 | 3900 | 40 | 35 | 19 |
| 100 | 2400 | 40 | 40 | 23 |
| 50 | 1100 | 40 | 45 | 26 |
| 0 | 0 | 40 | 50 | 30 |

213 263-B

▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

☞ *Generator power decreases as weld current increases.*

1 240 V 50 A AC Receptacle RC1

RC1 supplies 60 Hz single-phase power at weld/power speed. Maximum output is 12 kVA/kW.

2 120 V 20 A AC Duplex Receptacle RC2

3 120 V 20 A AC Duplex Receptacle RC3

RC2 and RC3 supply 60 Hz single-phase power at weld/power speed. Maximum output from RC2 or RC3 is 2.4 kVA/kW.

4 240 V 30 A, AC Twistlock Receptacle RC4

RC4 supplies 60 Hz three-phase power at weld/power speed. Maximum output is 12 kVA/kW.

5 Circuit Breaker CB1

CB1 protects RC1, RC2, and RC3 from overload. If CB1 opens, RC1, RC2, and RC3 do not work. Place switch in On position to reset breaker.

6 Circuit Breakers CB2 And CB3

CB2 protects RC2 and CB3 protects RC3 from from overload. If CB2 or CB3 opens, the receptacle does not work. Press button to reset breaker. Place switch in On position to reset breaker.

7 Circuit Breaker CB4

CB4 protects RC4 from overload. If CB4 opens, the receptacle does not work. Place switch in On position to reset breaker.

☞ *If a breaker continues to open, contact Factory Authorized Service Agent.*

Combined output of all receptacles limited to 12 kVA/kW rating of the generator.

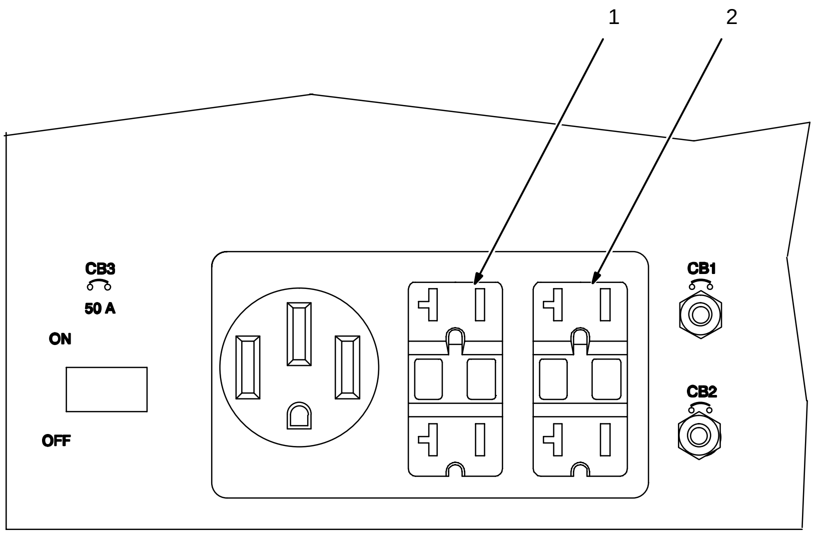
EXAMPLE: If 13 A is drawn from RC2 and RC3, only 37 A is available at RC1:

2 x (120 V x 13 A) + (240 V x 28 A) = 12 kVA/kW

8 Generator Power While Welding Table

## 7-2. Optional GFCI Receptacles And Circuit Breakers






▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

☞ *Generator power decreases as weld current increases.*

1 120 V 20 A AC GFCI Duplex Receptacle GFCI-2

2 120 V 20 A AC GFCI Duplex Receptacle GFCI-3

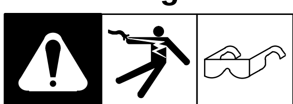
GFCI-2 and GFCI-3 supply 60 Hz single-phase power at weld/power speed. Maximum output from GFCI-2 or GFCI-3 is 2.4 kVA/kW. Circuit breaker protection is the same as standard receptacles.

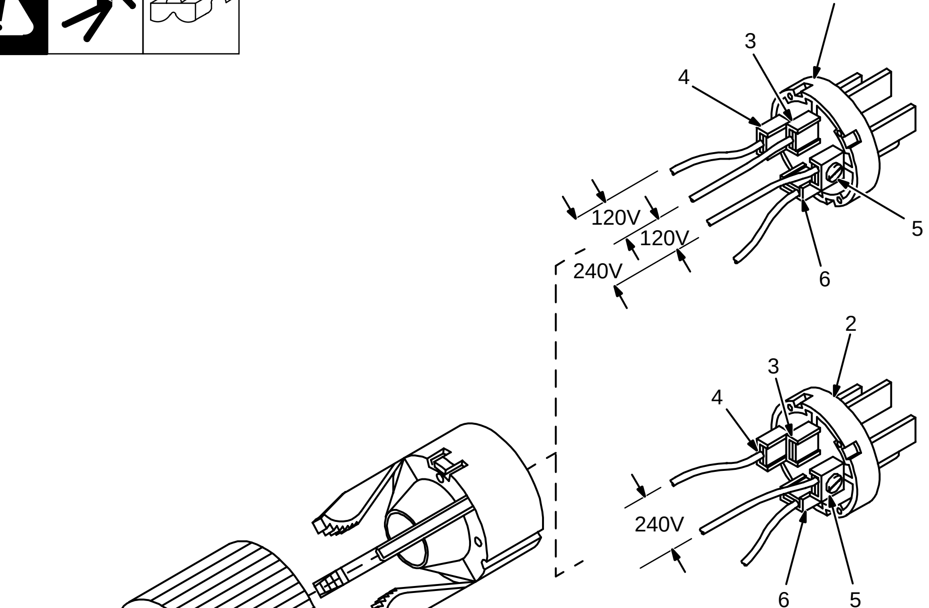
If a ground fault is detected, the GFCI Reset button pops out and the circuit opens to disconnect the faulty equipment. Check for damaged tools, cords, plugs, etc. connected to the receptacle. Press button to reset receptacle and resume operation.

☞ *At least once a month, run engine at weld/power speed and press Test button to verify GFCI is working properly.*

Ref. ST-207 554-A

## 7-3. Wiring Instructions For Optional 240 Volt, Single-Phase Plug (NEMA 14-50P)






The plug can be wired for a 240 V, 2-wire load or a 120/240V, 3-wire load. See circuit diagram.

1 Plug Wired for 120/240 V, 3-Wire Load

When wired for 120 V loads, each duplex receptacle shares a load with one half of 240 V receptacle.

2 Plug Wired for 240 V, 2-Wire Load

3 Neutral (Silver) Terminal

4 Load 1 (Brass)Terminal

5 Load 2 (Brass) Terminal

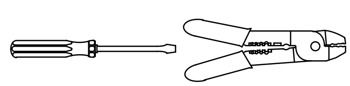
6 Ground (Green) Terminal

Strip cord jacket back enough to separate conductors.

Strip conductors enough to make good contact with plug terminals. Make plug connections and reinstall outer shell and cord grip.

Tighten assembly screws onto shell. Do not overtighten.

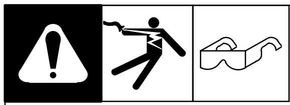
Tools Needed:

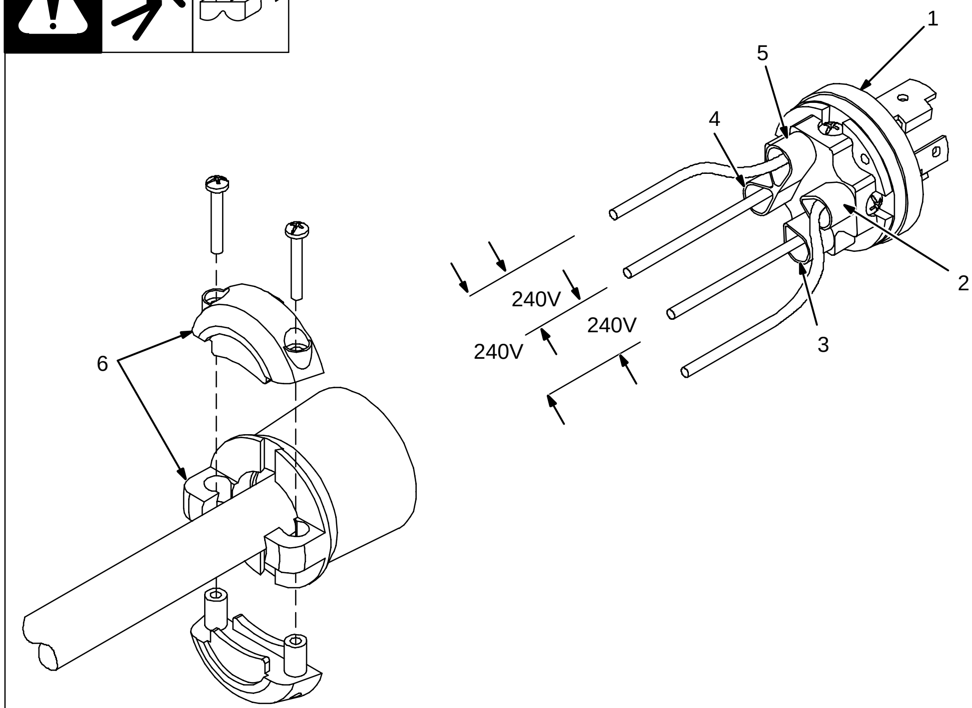


Plug1 7/99 − ST-120 813-D

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## 7-4. Wiring Instructions For Optional 240 Volt, 3-Phase Twistlock Plug (NEMA L15-30P)





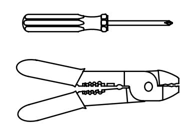

1. 240 V AC Three-Phase, 30 A, 3P4W Twistlock Plug
2. Load 1 (Brass) Terminal (X)
3. Load 2 (Brass)Terminal (Y)
4. Load 3 (Brass) Terminal (Z)
5. Ground (Green) Terminal (G)
6. Cord Grip

Strip cord jacket back enough to separate conductors.

Strip conductors enough to make good contact with plug terminals. Make plug connections and reinstall cord grip.

Tighten cord grip assembly screws. Do not overtighten.

Tools Needed:



Plug2 7/99 − 802 437

# Notes

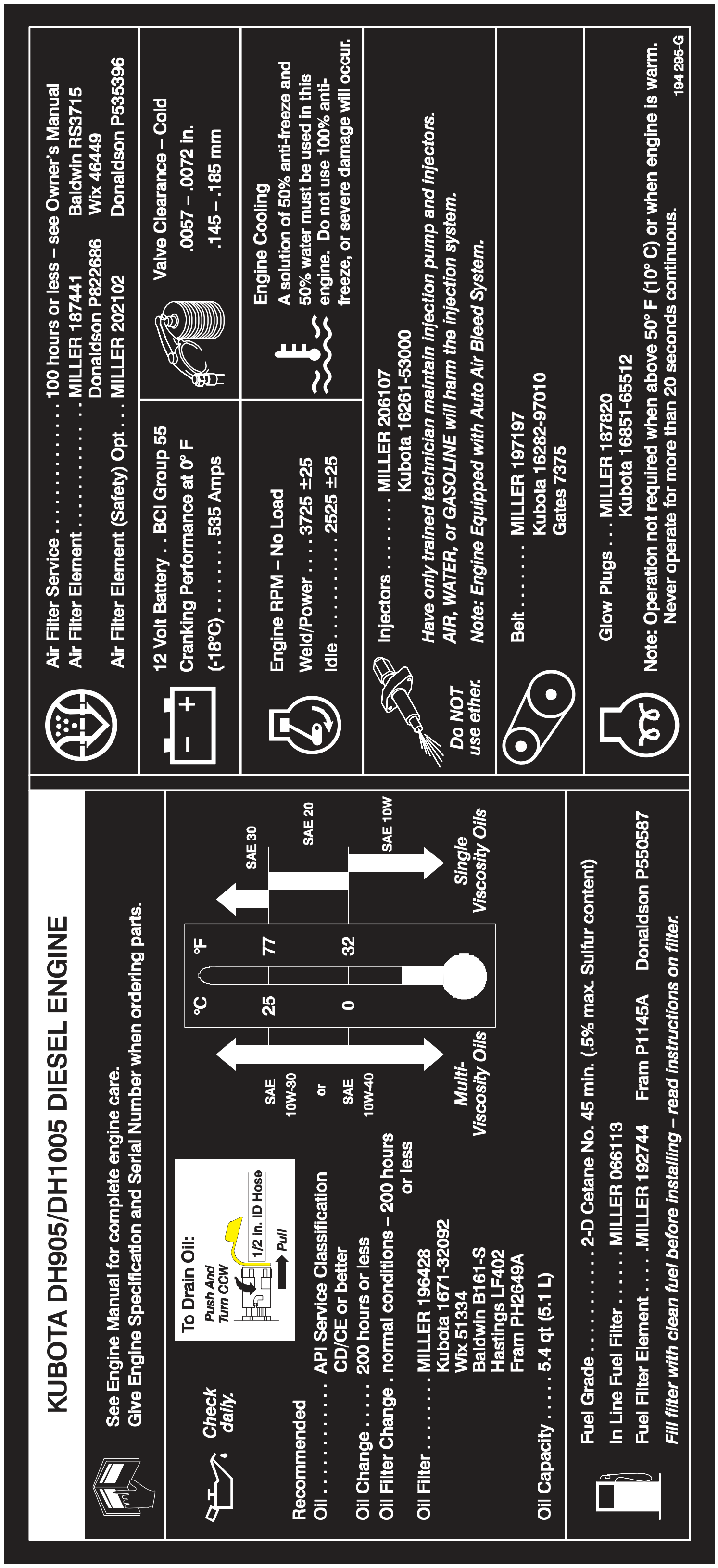
## MATERIAL THICKNESS REFERENCE CHART



**24 Gauge (.025 in)**
**22 Gauge (.031 in)**
**20 Gauge (.037 in)**
**18 Gauge (.050 in)**
**16 Gauge (.063 in)**
**14 Gauge (.078 in)**
**1/8 in (.125 in)**
**3/16 in (.188 in)**
**1/4 in (.25 in)**
**5/16 in (.313 in)**
**3/8 in (.375 in)**
**1/2 in (.5 in)**

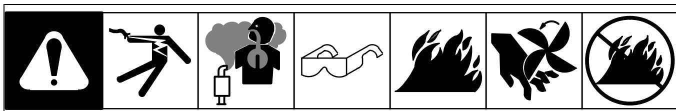
## SECTION 8 − MAINTENANCE AND TROUBLESHOOTING

### 8-1. Maintenance Label



## 8-2. Routine Maintenance

**Note** *Follow the storage procedure in the engine owner's manual if the unit will not be used for an extended period.*



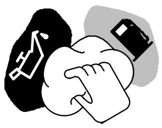
Recycle engine fluids.

▲ **Stop engine before maintaining.**

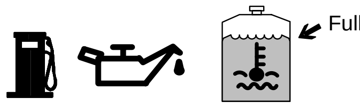
*See also Engine Manual and Maintenance Label. Service engine more often if used in severe conditions.*

* To be done by Factory Authorized Service Agent.

### Every 8 h

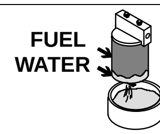


Wipe Up Spills.




Recovery Tank

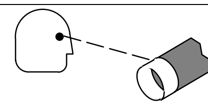
Check Fluid Levels. See Section 5-2.




Drain Water From Fuel System. See Section 8-5.

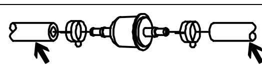
### Every 20 h

Check and clean optional spark arrestor screen. See Section 8-3.

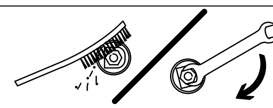


### Every 50 h

Check fuel lines and connections. See Section 8-5.



Clean and tighten weld terminals.

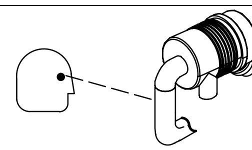


### Every 100 h

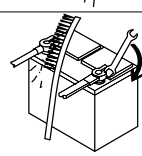
Service air filter element. See Section 8-4.



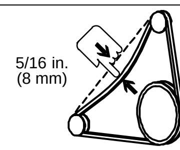
Check air cleaner hoses for cracks and loose clamps.



Clean and tighten battery connections.

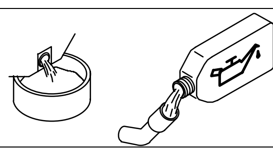


Check belt tension.

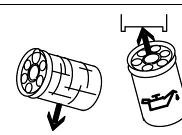



### Every 200 h

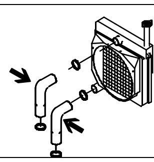
Change oil. See Section 8-5 and maintenance label.



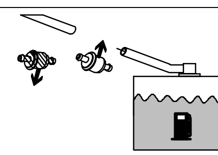
Change oil filter. See Section 8-5 and maintenance label.



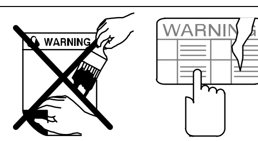
Check radiator hoses and clamps.



Replace primary fuel filter. See Section 8-5.

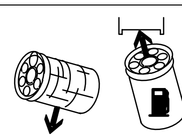


Replace unreadable labels.



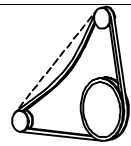

### Every 400 h

Replace secondary fuel filter. See Section 8-5.

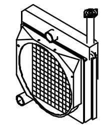


## Every 500 h

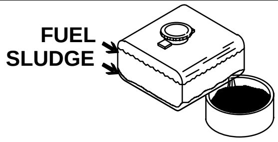
Replace fan belt.



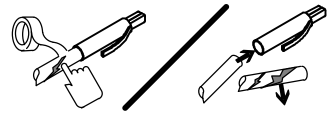
Flush radiator.



Drain sludge from fuel tank.

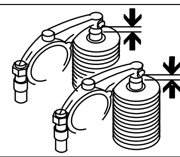



Repair or replace cracked cables.



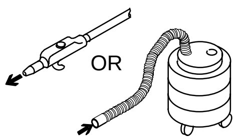
## Every 800 h

Check valve clearance.*

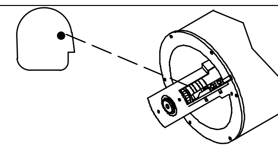


## Every 1000 h

Blow out or vacuum inside. During heavy service, clean monthly.

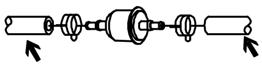



Service welding generator brushes and slip rings. Service more often in dirty conditions.*

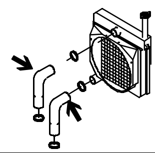


## Every 2000 h

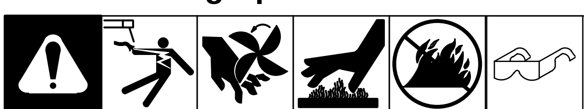
Replace fuel lines and clamps. See Section 8-5.

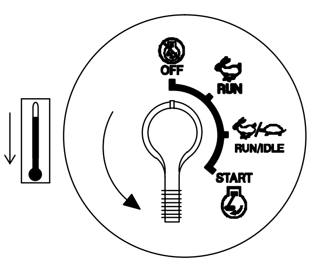


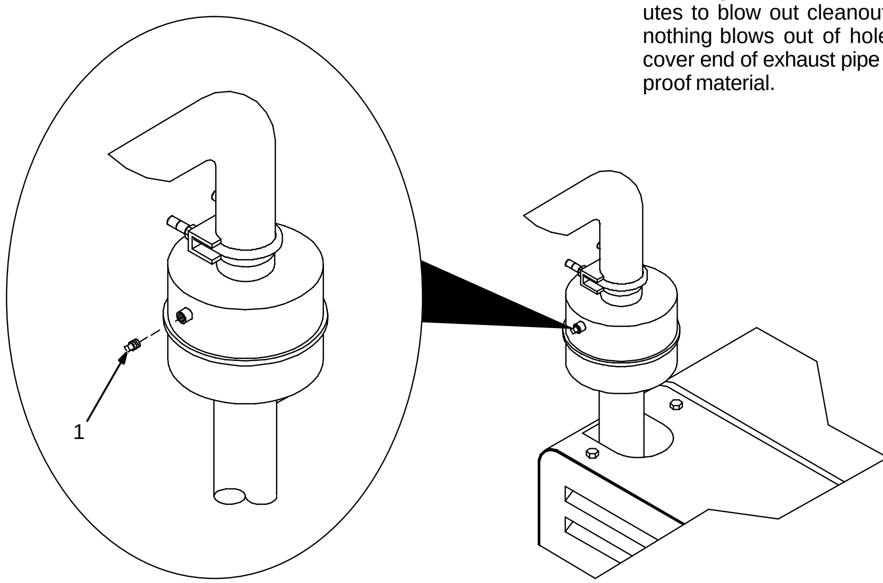
Replace radiator coolant and hoses. See Section 8-6.



## 8-3. Servicing Spark Arrestor





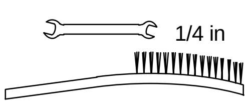

▲ **Stop engine and let cool.**

1 Cleanout Plug

Remove plug and remove any dirt covering cleanout hole.

Start engine and run several minutes to blow out cleanout hole. If nothing blows out of hole, briefly cover end of exhaust pipe with fireproof material.

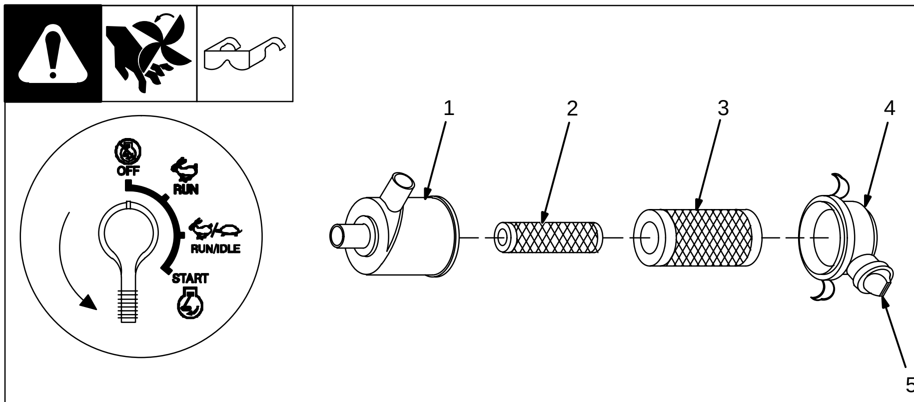
Tools Needed:



1/4 in

Ref. 213 263-B-B / 802 743 / Ref. 802 656

# 8-4. Servicing Air Cleaner




▲ **Stop engine.**

▲ **Do not run engine without air cleaner or with dirty element. Engine damage caused by using a damaged element is not covered by the warranty.**

☞ *The air cleaner primary element can be cleaned but the dirt holding capacity of the filter is reduced with each cleaning. The chance of dirt reaching the clean side of the filter while cleaning and the possibility of filter damage makes cleaning a risk. Consider the risk of unwarrantable equipment damage when determining whether to clean or replace the primary element.*

*If you decide to clean the primary element, we strongly recommend installing an optional safety element to provide additional engine protection.* ***Never clean a safety element.*** *Replace the safety element after servicing the primary element three times.*

Clean or replace primary element if dirty (see note above before cleaning). **Replace** primary element if damaged. Replace primary element yearly or after six cleanings.

1 Housing

2 Safety Element (Optional)

3 Primary Element

4 Dust Cap

5 Dust Ejector

**To clean air filter:**

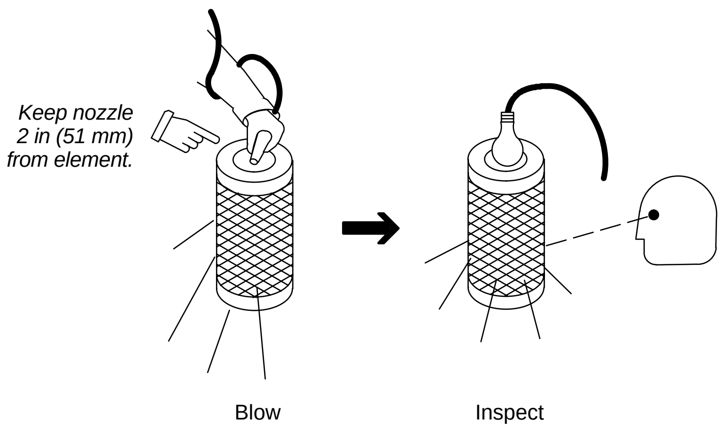
Wipe off cap and housing. Remove cap and dump out dust. Remove element(s). Wipe dust from inside cap and housing with damp cloth. Reinstall safety element (if present). Reinstall cap.

▲ **Do not clean housing with air hose.**

Clean primary element with compressed air only.

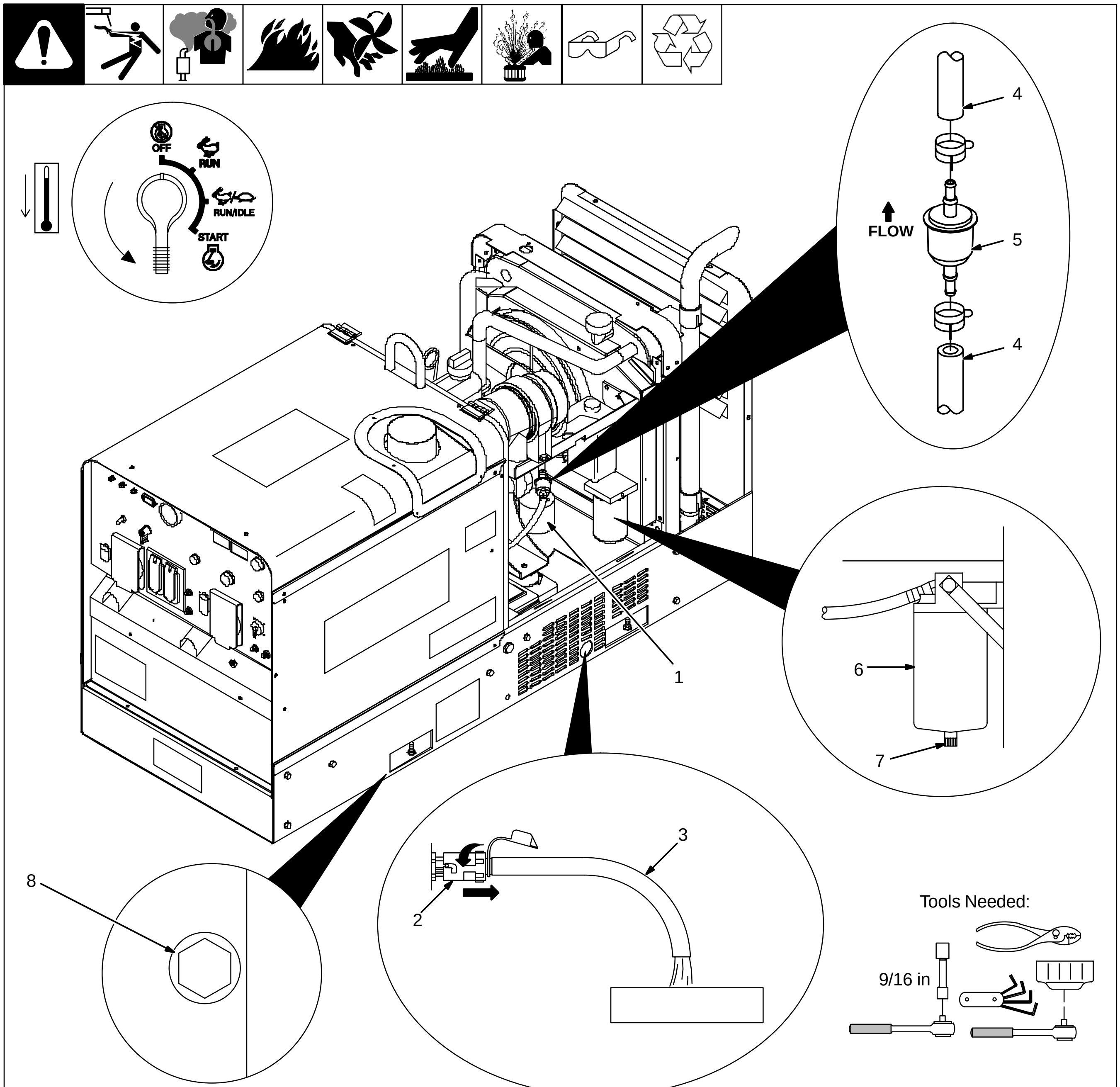
Air pressure must not exceed 100 psi (690 kPa). Use 1/8 in (3 mm) nozzle and keep nozzle at least 2 in (51 mm) from inside of element. Replace primary element if it has holes or damaged gaskets.

Reinstall primary element and cap (dust ejector down).




aircleaner1 9/00 − ST-153 929-B / ST-153 585 / Ref. S-0698-B

## 8-5. Servicing Engine Lubrication And Fuel Systems




Ref. 213 263-B / 802 330-G / S-0842

▲ **Stop engine and let cool.**

1 Oil Filter
2 Oil Drain Valve
3 1/2 ID x 12 in Hose
4 Fuel Line
5 Primary Fuel Filter
6 Secondary Fuel Filter
7 Petcock
8 Fuel Tank Sludge Drain

**To change oil and filter:**

Pull oil drain hose through access hole in base. Change engine oil and filter according to instructions in engine manual.

▲ **Close valve and valve cap before adding oil and running engine.**

Fill crankcase with new oil to full mark on dipstick (see Section 5-2).

**To drain water from fuel system:**

Open secondary fuel filter petcock and drain water into metal container. Close petcock when water-free fuel flows.

**To change fuel filters:**

Install new primary fuel filter as shown.

Replace secondary fuel filter according to engine manual.

Replace fuel lines if cracked or worn.

Wipe up any spilled fuel.

▲ **After servicing, start engine and check for fuel leaks.**

**Stop engine, tighten connections as necessary, and wipe up fuel.**

**To change coolant:**

Change coolant according to engine manual.

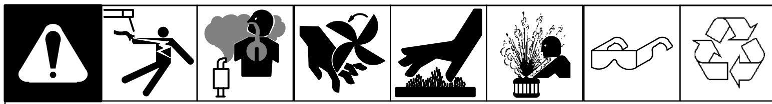
Run engine until engine reaches normal operating temperature. Loosen air bleed screw to remove air from cooling system. Tighten screw.

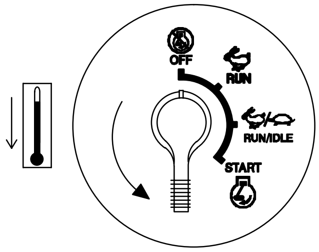
Check coolant level in recovery tank. Add coolant if necessary.

**To drain sludge from fuel tank:**

Put metal container under drain, and remove sludge drain plug. Reinstall plug when done.

## 8-6. Servicing Engine Cooling System






▲ **Stop engine and let cool.**

1 Radiator Draincock

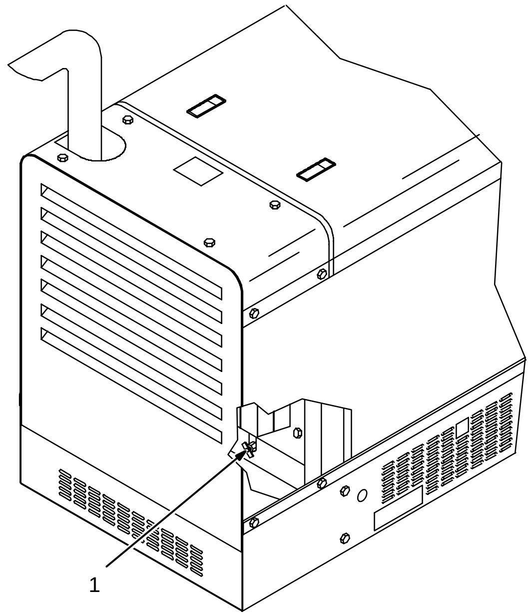
2 Radiator Cap

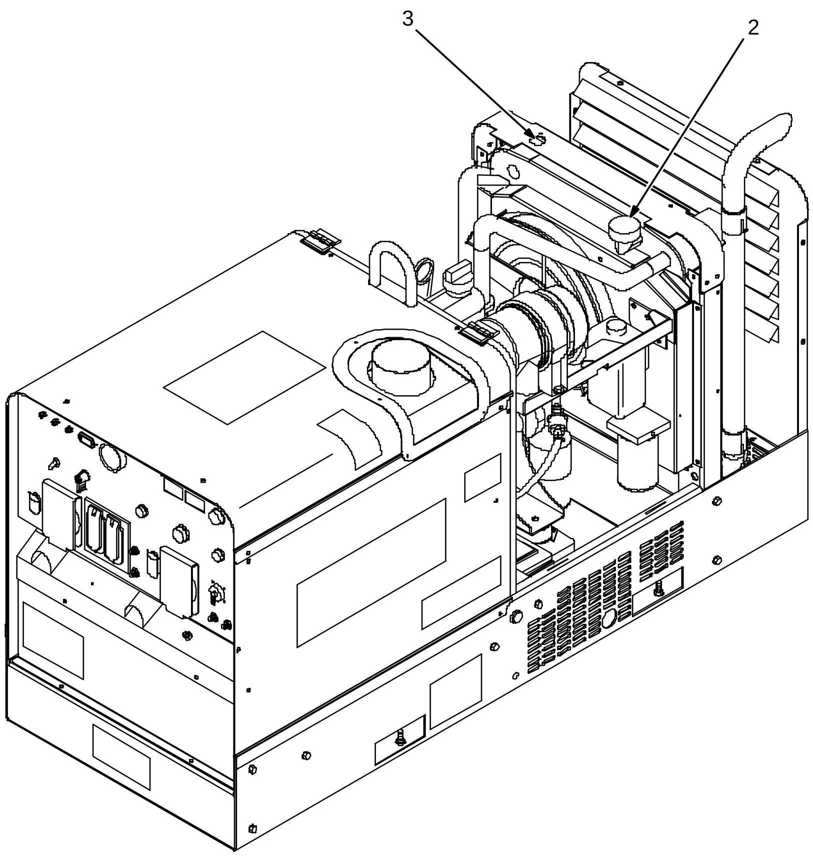
3 Radiator Air Bleed Screw

Change coolant according to engine manual. Add coolant according to Section 5-3).

Run engine until engine reaches normal operating temperature. Loosen air bleed screw to remove air from cooling system. Tighten screw.

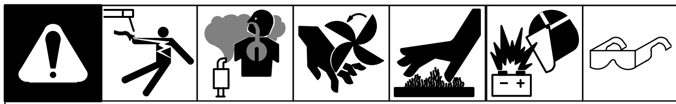
Check coolant level in recovery tank. Add coolant if necessary

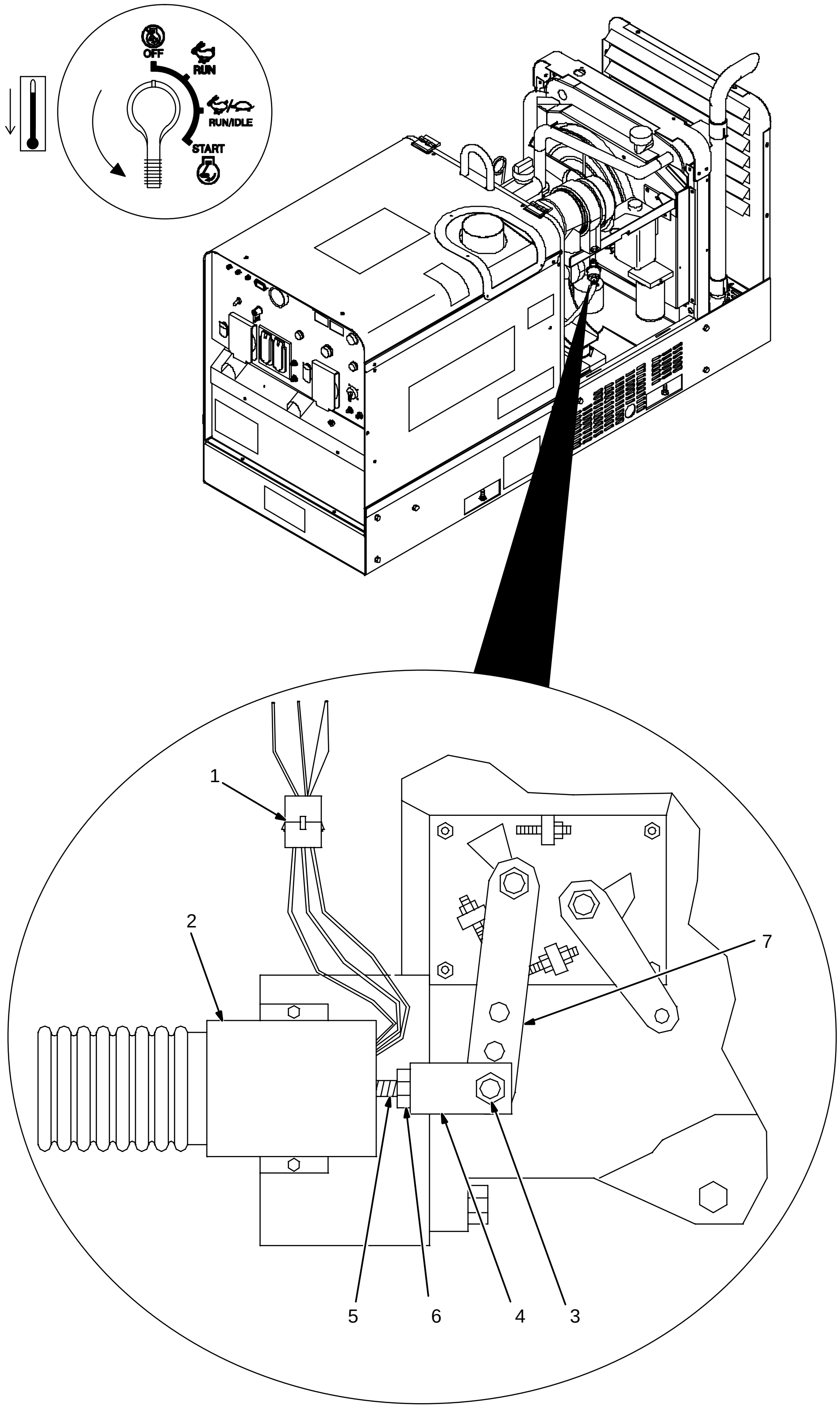



802 330-G / 802 581

## 8-7. Replacing Throttle Solenoid TS1






▲ **Stop engine, and let cool.**

▲ **Disconnect battery, negative (−) cable first.**

Remove right side engine panel.

1 Plug PLG39/Receptacle RC39
2 Throttle Solenoid TS1
3 Shoulder Bolt And Nut
4 Throttle Link
5 Throttle Solenoid Plunger Rod
6 Jam Nut
7 Throttle Arm

Disconnect solenoid plug PLG39 from wiring harness receptacle RC39.

Remove shoulder bolt and nut from throttle link.

Remove solenoid from mounting bracket.

Note how much thread is visible on solenoid plunger rod. Loosen jam nut just enough so throttle link can be removed from solenoid rod.

Install throttle link on new solenoid plunger rod. Turn link until the same amount of thread will be visible on plunger rod when the jam nut is tightened. (Do not tighten jam nut yet.)

Mount solenoid on bracket. Move solenoid plunger manually to align slot in throttle link with hole in throttle arm. Insert shoulder bolt through slot/hole and secure with nut.

☞ *Be sure solenoid plunger rod pulls all the way in "bottoms" when energized. If plunger rod does not pull all the way in, re-adjust throttle link.*

Tighten jam nut on solenoid plunger rod. Verify all other hardware is tight.

Connect solenoid plug PLG39 to wiring harness receptacle RC39.

Reconnect battery, negative (−) lead last.

Check engine speeds and adjust if necessary according to Section 8-8.

Reinstall side panel.

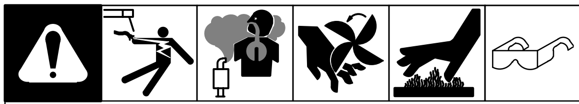
Tools Needed:

7/16, 3/8, 1/2 in
10 mm

3/16 in

802 330-B

## 8-8. Adjusting Engine Speed



| | |
|---|---|
| | 2500 rpm |
| | 3750 Max |

After tuning engine, check engine speeds with a tachometer (see table). If necessary, adjust speeds as follows:

Start engine and run until warm. Turn V/A control to max.

**Adjusting Idle Speed**

Turn Engine Control switch to Run/ Idle position.

1 Throttle Solenoid

2 Idle Speed Jam Nut

3 Idle Speed Screw

Loosen nut and turn screw clockwise to increase idle speed. Turn screw counterclockwise to decrease idle speed. Tighten nut.

See engine manual for governor sensitivity adjustment.

**Adjusting Weld/Power Speed**

4 Weld Speed Jam Nut

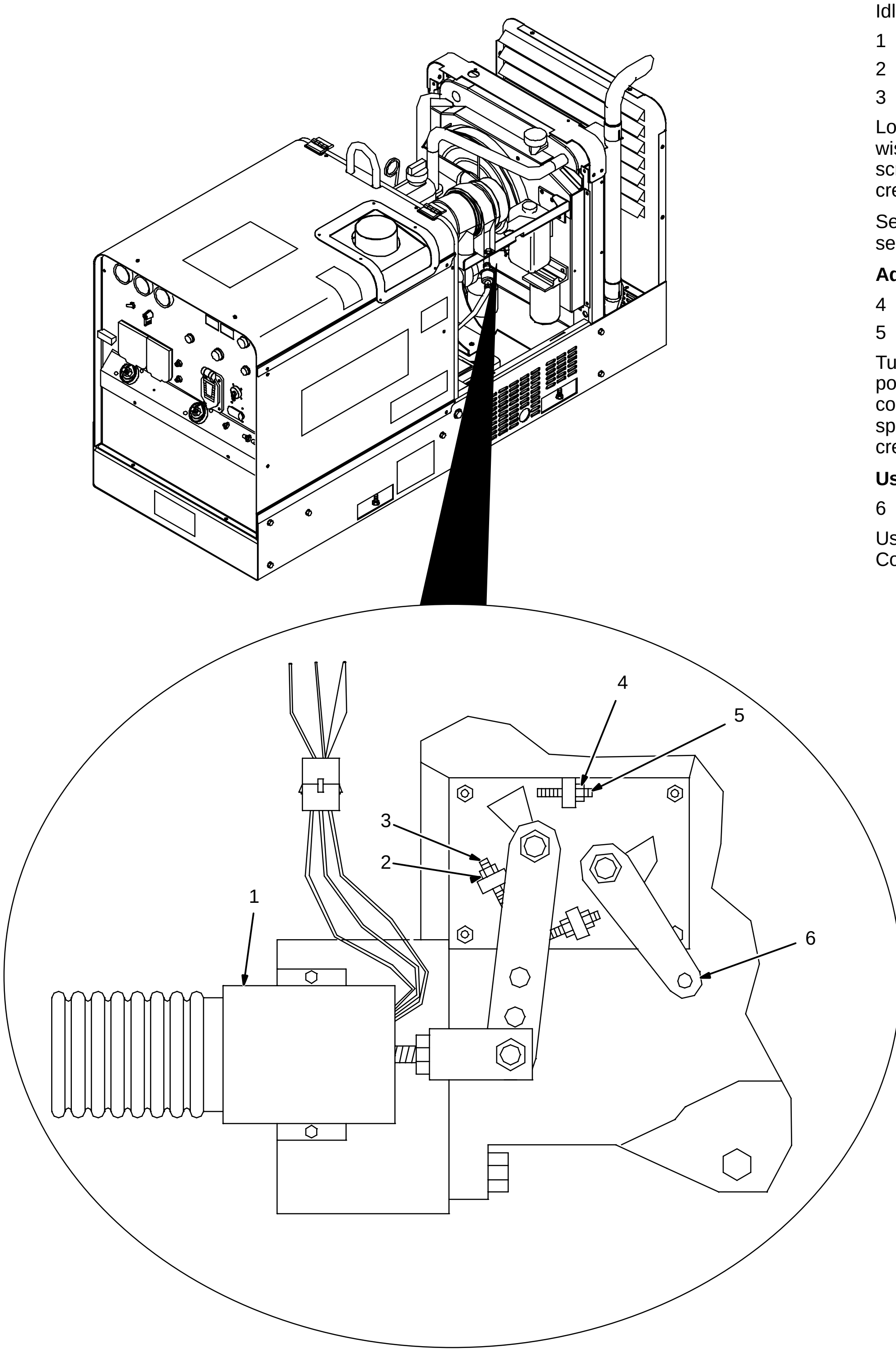
5 Adjustment Screw

Turn Engine Control switch to Run position. Loosen nut and turn screw counterclockwise to increase speed. Turn screw clockwise to decrease speed. Tighten nut.

**Using Engine Stop Lever**

6 Engine Stop Lever

Use lever to stop engine if Engine Control switch does not work.

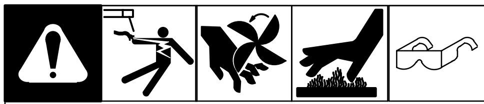



Tools Needed:

10 mm

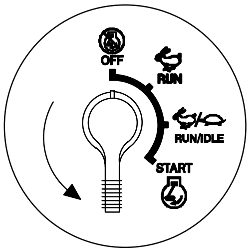
802 330-B

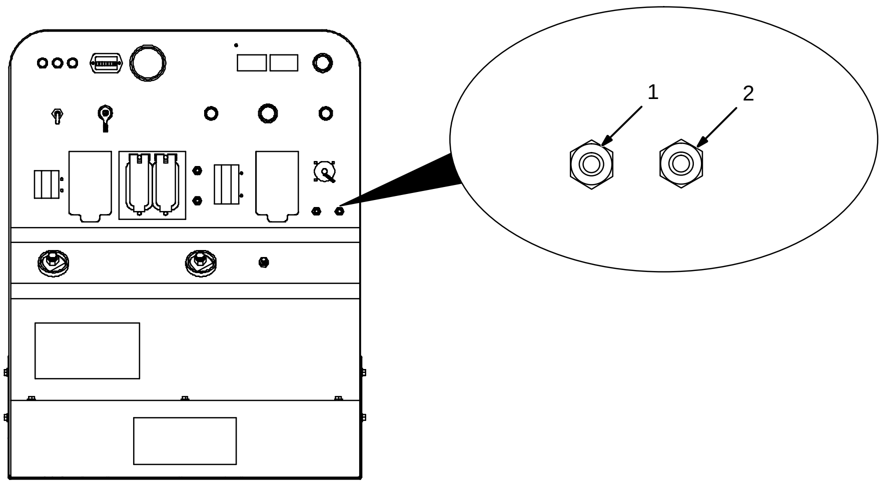
## 8-9. Overload Protection

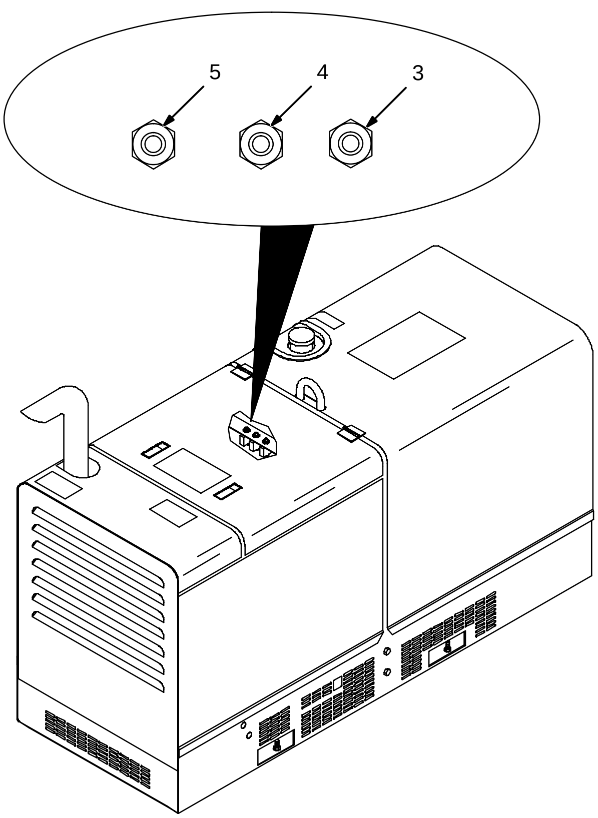


Tools Needed:

3/8 in




▲ **Stop engine.**

☞ *When a circuit breaker opens, it usually indicates a more serious problem exists. Contact Factory Authorized Service Agent.*

1 Circuit Breaker CB5

CB5 protects the 115 volt ac output to Remote 14 receptacle RC14. If CB5 opens, 115 volt ac output to RC14 stops.

2 Circuit Breaker CB6

CB6 protects the 24 volt ac output to Remote 14 receptacle RC14. If CB6 opens, 24 volt ac output to RC14 stops.

Press button to reset breaker.

3 Circuit Breaker CB7

4 Circuit Breaker CB8

5 Circuit Breaker CB10

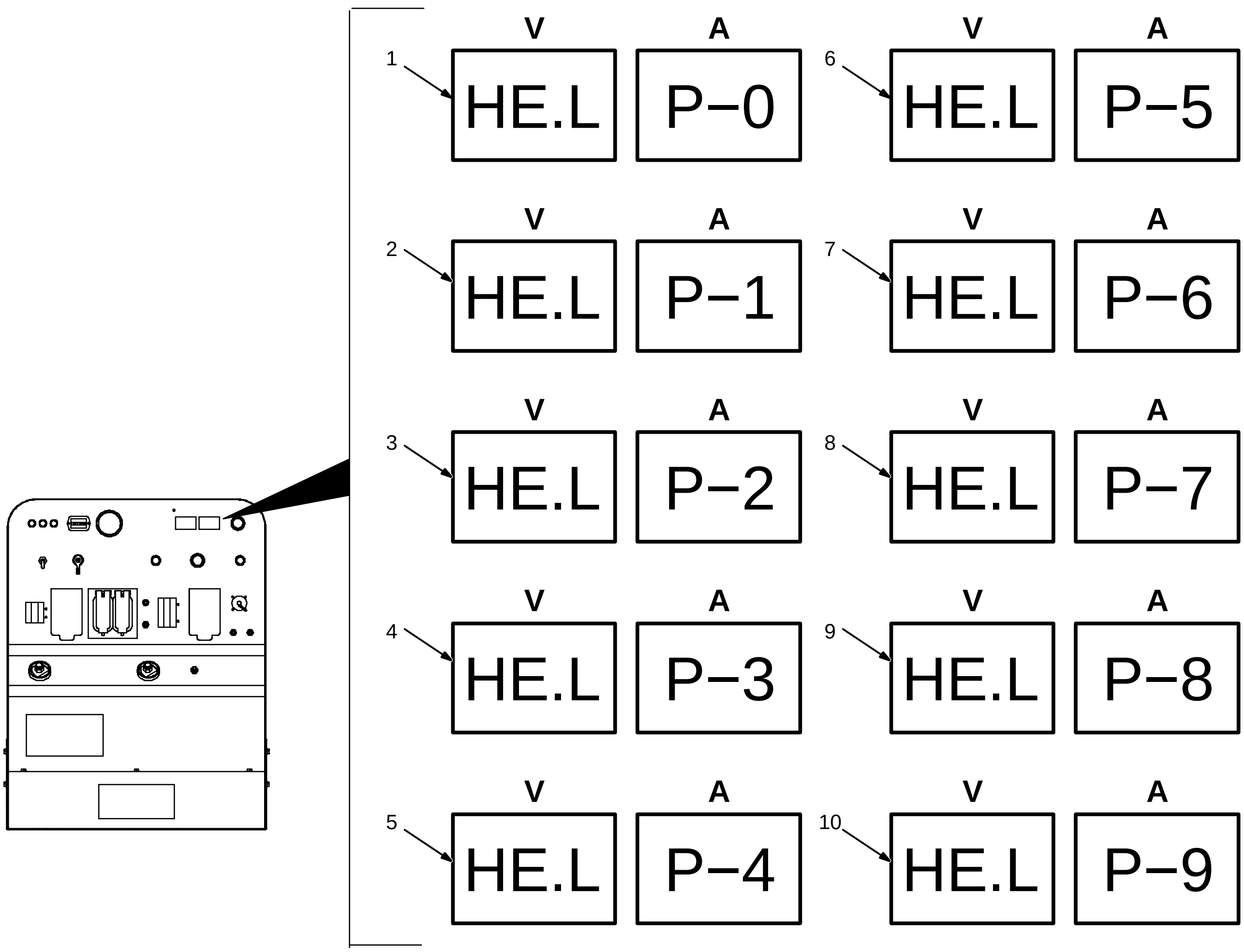
CB7 protects the engine glow plug from overload. If CB7 opens, the glow plug does not work and engine may not start in cold weather. Check continuity and connections of engine glow plug.

CB8 protects the engine wiring system from overload. If CB8 opens, the engine will not crank. Check battery, starter, and engine control switch.

CB10 protects the engine fuel solenoid from overload. If CB10 opens, the engine cranks but does not start. Check fuel solenoid FS1 for obstructions.

Ref. 213 263-B-B / 802 174-E / 802 175-D

## 8-10. Voltmeter/Ammeter Help Displays




802 174-G

Use the voltmeter/ammeter help displays to help determine the cause of no weld output. When a help display is shown, the inverter module weld output has stopped but the engine continues to run. Correct the problem before resuming operation.

The display screen resets when the fault is corrected.

☞ *All directions are in reference to the front of the unit. All circuitry referred to is located inside the inverter module.*

1 Help 0 Display

Indicates a shorted thermistor RT2 on the left side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

2 Help 1 Display

Indicates a malfunction in the primary power circuit possibly caused by applying a high weld load at idle speed. Turn Engine Control switch to Run position. If problem continues, contact a Factory Authorized Service Agent.

3 Help 2 Display

Indicates a malfunction in the thermal protection circuitry located on the left side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

4 Help 3 Display

Indicates the left side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 4-3). Operation will continue when the unit has cooled.

5 Help 4 Display

Indicates a malfunction in the thermal protection circuitry located on the right side of the unit. If this display is shown, contact a Factory Authorized Service Agent.

6 Help 5 Display

Indicates the right side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 4-3). Operation will continue when the unit has cooled.

7 Help 6 Display

Indicates that the input voltage is too low and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable lower range limit (15% below the applicable input voltage). If this display is shown, have a Factory Authorized Service Agent check the power generator output voltage.

8 Help 7 Display

Indicates that the input voltage is too high and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable upper range limit (15% above the applicable input voltage). If this display is shown, have a Factory Authorized Service Agent check the power generator output voltage.

9 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. If this display is shown, contact a Factory Authorized Service Agent.

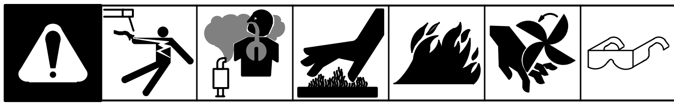
10 Help 9 Display

Indicates a shorted thermistor RT1 on the right side of the unit. If this display is shown, contact a Factory Authorized Service Agent.



Return To Table Of Contents

## 8-11. Troubleshooting



### A. Welding

| Trouble | Remedy |
|---|---|
| No weld output. | Check control settings. |
| | Check weld connections. |
| | Disconnect equipment from generator power receptacles during start-up. |
| | If using remote control, be sure mode switch is in a position that provides output control at Remote 14 receptacle (see Sections 5-8 and 6-1). |
| | Check, repair, or replace remote control. |
| | Unit overheated. Allow unit to run so fan cools unit (see Section 4-3). |
| | Have Factory Authorized Service Agent check brushes, slip rings, power board PC7, voltage regulator board PC8, interconnecting board PC2, and control board PC1. |
| Ammeter and voltmeter do not work after unit has run out of fuel. | Restart the engine. |
| Low weld output. | Check control settings. |
| | Place V/A Control switch in Panel position, or move switch to Remote position and connect remote amperage/voltage control to Remote 14 receptacle RC14 (see Section 5-8). |
| | Check and clean air cleaner as necessary (see Section 8-4). |
| | Check engine speed, and adjust if necessary (see Section 8-8). |
| | If using remote control, be sure mode switch is in a position that provides output control at Remote 14 receptacle RC14 (see Sections 5-8 and 6-1). |
| | Have Factory Authorized Service Agent check brushes, slip rings, voltage regulator board PC8, interconnecting board PC2, and control board PC1. |
| | See engine manual. |
| High weld output. | Check control settings. |
| | Check engine speed, and adjust if necessary (see Section 8-8). |
| | Check for obstructed movement of throttle solenoid linkage. |
| | Have Factory Authorized Service Agent check voltage regulator board PC8 and control board PC1. |
| Weld output cannot be adjusted. | Check position of V/A Control switch (see Section 6-1). |
| | Have Factory Authorized Service Agent check voltage regulator board PC8 and control board PC1. |
| Erratic weld output. | Check control settings. |
| | Clean and tighten connections both inside and outside unit. |
| | Check and secure lead connections to A/V control. |
| | Be sure connection to work piece is clean and tight. |
| | Remove excessive coils from weld cables. |
| | Use dry, properly stored electrodes. |
| | Check engine speed, and adjust if necessary (see Section 8-8). |
| | Have Factory Authorized Service Agent check brushes, slip rings, voltage regulator board PC8, interconnecting board PC2, and control board PC1. |

| Trouble | Remedy |
| --- | --- |
| Remote contactor control does not activate contactor. | Check and tighten connections to Remote 14 receptacle RC14 (see Section 5-8). |
| Lack of high frequency; difficulty in establishing Gas Tungsten Arc Welding arc. | Use proper size tungsten for welding amperage. |
| | Reduce leakage of high frequency from torch or work cable (check grounding, remove excessive coils from weld cables, use shorter weld cables, etc.). |
| | Check cables and torch for cracked or deteriorated insulation or bad connections. Repair or replace necessary parts. |
| Wandering arc − poor control of arc direction. | Reduce gas flow rate. |
| | Select proper size tungsten. Properly prepare tungsten. |
| Tungsten electrode oxidizing and not remaining bright after conclusion of weld. | Shield weld zone from drafts. |
| | Increase postflow time. |
| | Check and tighten all gas fittings. |
| | Properly prepare tungsten. |
| No 115 volt ac output at Remote 14 receptacle RC14. | Reset circuit breaker CB5 (see Section 8-9). |
| No 24 volt ac output at Remote 14 receptacle RC14. | Reset circuit breaker CB6 (see Section 8-9). |

## B. Generator Power

| Trouble | Remedy |
| --- | --- |
| No power output. | Reset circuit breakers (see Section 7-1). |
| | Have Factory Authorized Service Agent check brushes, slip rings, power board PC7, voltage regulator board PC8, interconnecting board PC2, and control board PC1. |
| Low power output. | Check air cleaner, and clean or replace element if necessary. |
| | Check engine speed, and adjust if necessary (see Section 8-8). |
| | See engine manual. |
| High power output. | Check engine speed, and adjust if necessary (see Section 8-8). |
| Erratic power output. | Check receptacle wiring and connections. |
| | Check governor according to engine manual. |
| | Have Factory Authorized Service Agent check brushes, slip rings, power board PC7, voltage regulator board PC8, interconnecting board PC2, and control board PC1. |

## C. Engine

| Trouble | Remedy |
|---|---|
| Engine will not crank. | Reset circuit breaker CB8 (see Section 8-9). |
| | Check battery voltage. |
| | Check battery connections and tighten if necessary. |
| | Have Factory Authorized Service Agent check Engine Control switch S2. |
| Engine cranks, but does not start. | Check fuel level (see Section 5-2). |
| | Open fuel valve (see Section 5-2). |
| | Check oil level (see Section 5-2). Engine will not start if oil pressure is low. |
| | Reset circuit breaker CB10 (see Section 8-9). |
| | Check coolant level and fan belt (see Section 5-2 and engine manual). Engine will not start if coolant temperature is high. |
| | Use Glow Plug switch if unit does not start in cold weather. If unit still does not start, reset circuit breaker CB7 (see Section 8-9). |
| | Service primary and secondary fuel filters (see Section 8-5). |
| | Check battery and replace if necessary. |
| | Check engine charging system according to engine manual. |
| | Bleed air from fuel system according to engine manual. |
| | Reset customer-supplied emergency air shutdown valve (if equipped) (see Section 5-9). |
| | Have Factory Authorized Service Agent check low oil pressure switch S5, engine coolant temperature switch S4, and control relay CR1. |
| | See engine manual. |
| Engine starts, but stops when Engine Control switch returns to Run position. | Check oil level (see Section 5-2). Engine will not start if oil pressure is too low. |
| | Check coolant level and fan belt (see Section 5-2 and engine manual). Engine will not start if engine temperature is too high. |
| | Check and refill crankcase with proper viscosity oil for operating temperature, if necessary (see engine manual). |
| | Have Factory Authorized Service Agent check low oil pressure switch S5, engine coolant temperature switch S4, Engine Control switch S2, control relay CR1, and voltage regulator board PC8. |
| Engine does not stop. | Stop engine by pushing down engine stop lever (see Section 5-2) or closing fuel valve (see Section 5-2). After stopping engine, adjust fuel solenoid linkage (see engine manual). |
| Engine stopped during normal operation. | Check fuel level (see Section 5-2). |
| | Open fuel valve (see Section 5-2). |
| | Check oil level (see Section 5-2). Engine stops if oil pressure is too low. |
| | Check coolant level and fan belt (see Section 5-2 and engine manual). Engine stops if engine temperature is too high. |
| | Bleed air from fuel system according to engine manual. |
| | Have Factory Authorized Service Agent check low oil pressure switch S5 and engine coolant temperature switch S4. |
| Battery discharges between uses. | Clean top of battery with baking soda and water solution; rinse with clear water. |
| | Periodically recharge battery (approximately every 3 months). |
| | Replace battery. |
| | Check voltage regulator according to engine manual. |

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| Trouble | Remedy |
|---|---|
| Engine does not go to low (idle) speed with Engine Control switch in Run/Idle position. | Be sure Engine Control switch S2 is in Run/Idle position. |
| | Remove all weld and generator power loads. |
| | Turn off remote device connected to Remote 14 receptacle RC14 (see Section 5-8). |
| | Check for obstructed movement of throttle solenoid linkage. |
| | Have Factory Authorized Service Agent check voltage regulator board PC8 and current transformer CT1. |
| Engine does not go to high (run) speed when generator power or large weld load is applied with Engine Control switch in Run/Idle position. | Place Engine Control switch in the Run position. Have Factory Authorized Service Agent check unit. |
| Engine uses oil during run-in period; wetstacking occurs. | Dry engine (see Section 10 and engine manual). |
| Coolant recovery tank continuously overflows. | Bleed air from radiator, and replace lost coolant (see Section 5-3). |

# Notes



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# Notes

## DECIMAL EQUIVALENTS

| Fraction | Decimal |
|---|---|
| 1/64 | .015625 |
| 1/32 | .03125 |
| 3/64 | .046875 |
| 1/16 | .0625 |
| 5/64 | .078125 |
| 3/32 | .09375 |
| 7/64 | .109375 |
| 1/8 | .125 |
| 9/64 | .140625 |
| 5/32 | .15625 |
| 11/64 | .171875 |
| 3/16 | .1875 |
| 13/64 | .203125 |
| 7/32 | .21875 |
| 15/64 | .234375 |
| 1/4 | .25 |
| 17/64 | .265625 |
| 9/32 | .28125 |
| 19/64 | .296875 |
| 5/16 | .3125 |
| 21/64 | .328125 |
| 11/32 | .34375 |
| 23/64 | .359375 |
| 3/8 | .375 |
| 25/64 | .390625 |
| 13/32 | .40625 |
| 27/64 | .421875 |
| 7/16 | .4375 |
| 29/64 | .453125 |
| 15/32 | .46875 |
| 31/64 | .484375 |
| 1/2 | .5 |
| 33/64 | .515625 |
| 17/32 | .53125 |
| 35/64 | .546875 |
| 9/16 | .5625 |
| 37/64 | .578125 |
| 19/32 | .59375 |
| 39/64 | .609375 |
| 5/8 | .625 |
| 41/64 | .640625 |
| 21/32 | .65625 |
| 43/64 | .671875 |
| 11/16 | .6875 |
| 45/64 | .703125 |
| 23/32 | .71875 |
| 47/64 | .734375 |
| 3/4 | .75 |
| 49/64 | .765625 |
| 25/32 | .78125 |
| 51/64 | .796875 |
| 13/16 | .8125 |
| 53/64 | .828125 |
| 27/32 | .84375 |
| 55/64 | .859375 |
| 7/8 | .875 |
| 57/64 | .890625 |
| 29/32 | .90625 |
| 59/64 | .921875 |
| 15/16 | .9375 |
| 61/64 | .953125 |
| 31/32 | .96875 |
| 63/64 | .984375 |
| 1 | 1. |

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# SECTION 9 − ELECTRICAL DIAGRAMS

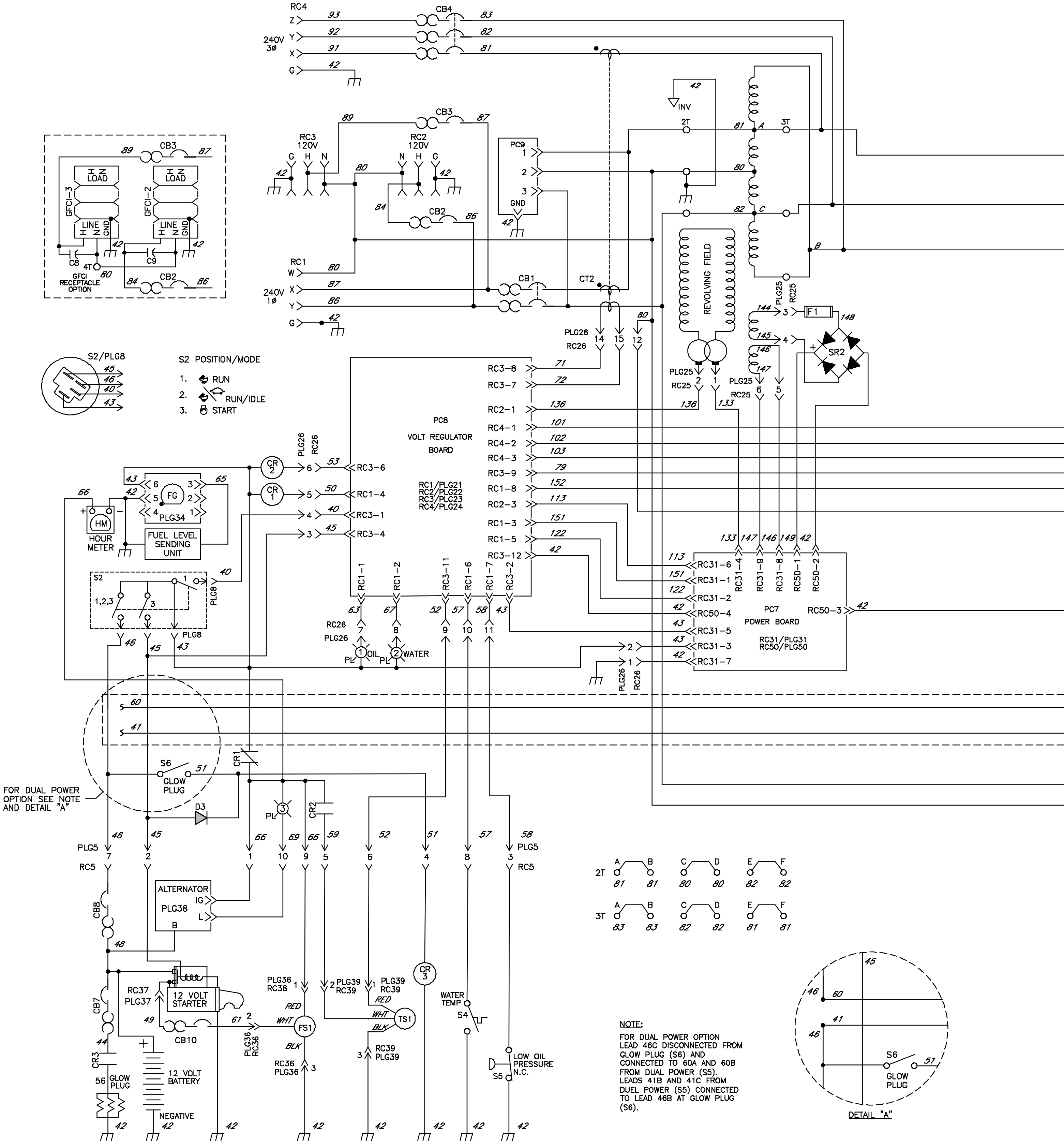
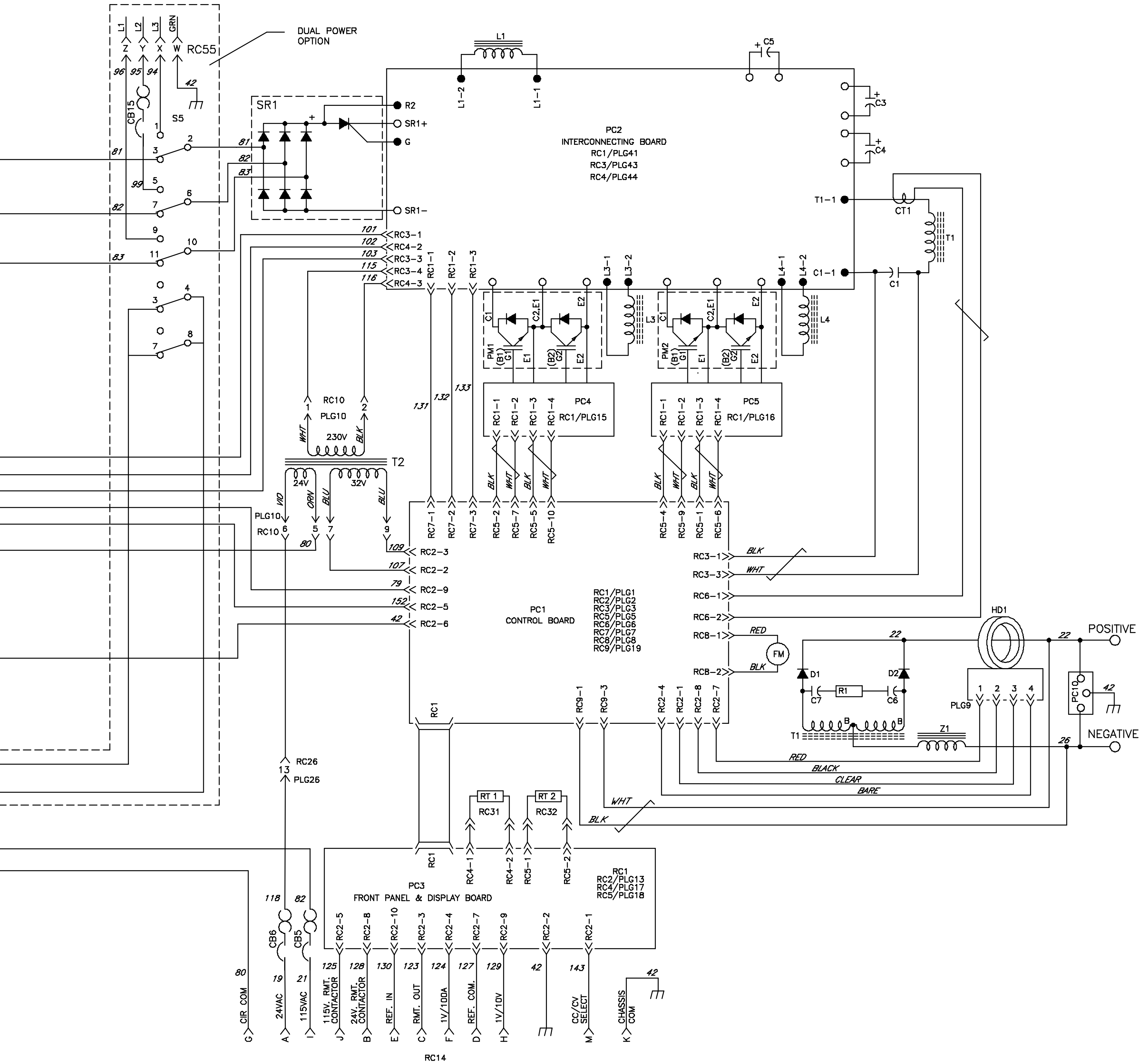


**Figure 9-1. Circuit Diagram For Welding Generator**



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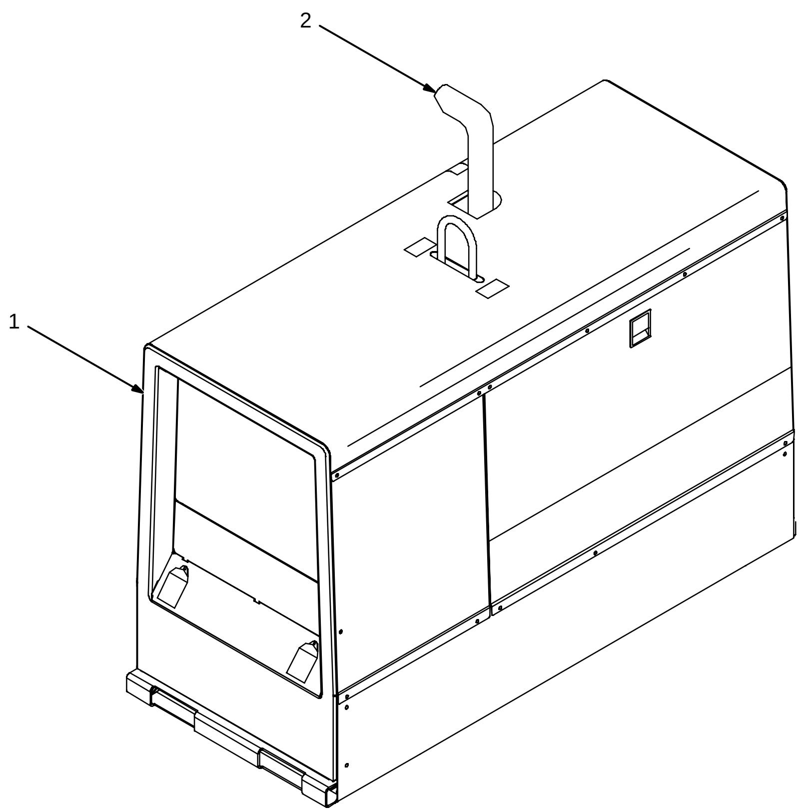
| ⚠ WARNING | • Do not touch live electrical parts.<br>• Disconnect input power or stop engine before servicing.<br>• Do not operate with covers removed.<br>• Have only qualified persons install, use, or service this unit. |
|---|---|
| ELECTRIC SHOCK HAZARD | |

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# SECTION 10 − RUN-IN PROCEDURE

run_in4 8/01

## 10-1. Wetstacking




▲ **Do not perform run-in procedure at less than 20 volts weld output and do not exceed duty cycle or equipment damage may occur.**

1 Welding Generator

Run diesel engines near rated voltage and current during run-in period to properly seat piston rings and prevent wetstacking. See nameplate, rating label, or specifications section in this manual to find rated voltage and current.

☞ *Do not idle engine longer than necessary. Piston rings seat faster if engine runs at weld/power rpm, and the welding generator is kept loaded during run-in.*

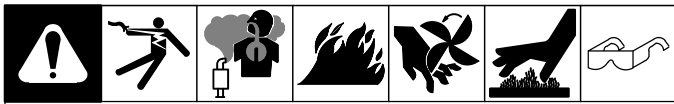
2 Engine Exhaust Pipe

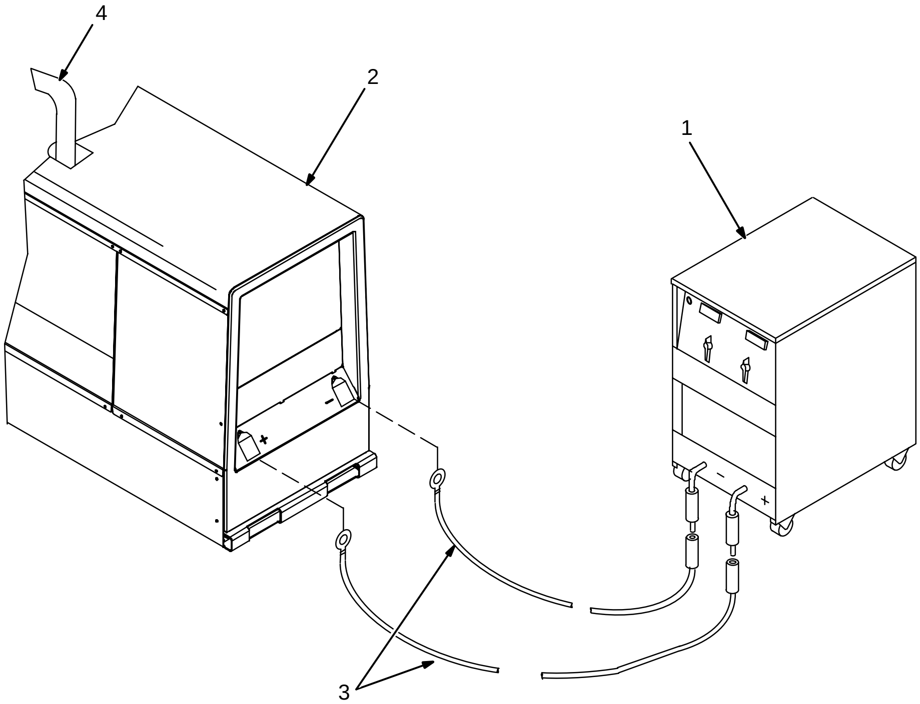
Wetstacking is unburned fuel and oil in the exhaust pipe and occurs during run-in if the engine is run too long at light load or idle rpm.

If exhaust pipe is coated with a wet, black, tar-like substance, dry the engine using one of the following run-in procedures.

See the engine manual for additional engine run-in information.

## 10-2. Run-In Procedure Using Load Bank






▲ **Stop engine.**

▲ **Do not touch hot exhaust pipe, engine parts, or load bank/grid.**

▲ **Keep exhaust and pipe away from flammables.**

▲ **Do not perform run-in procedure at less than 20 volts weld output and do not exceed duty cycle or equipment damage may occur.**

1 Load Bank

Turn all load bank switches Off. If needed, connect load bank to 115 volts ac wall receptacle or generator auxiliary power receptacle.

2 Welding Generator

3 Weld Cables

Connect load bank to generator weld output terminals using proper size weld cables with correct connectors. Observe correct polarity.

Start engine and run for several minutes.

Set load bank switches and then adjust generator V/A control so load equals 225 amps at 30 volts.

Check generator and load bank meters after first five minutes then every fifteen minutes to be sure generator is loaded properly.

☞ *Check oil level frequently during run-in; add oil if needed.*

After one hour (minimum) place V/A control in minimum position, then turn off load bank to remove load. Run engine several minutes at no load.

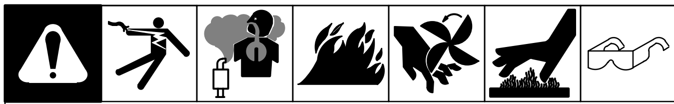
▲ **Stop engine and let cool.**

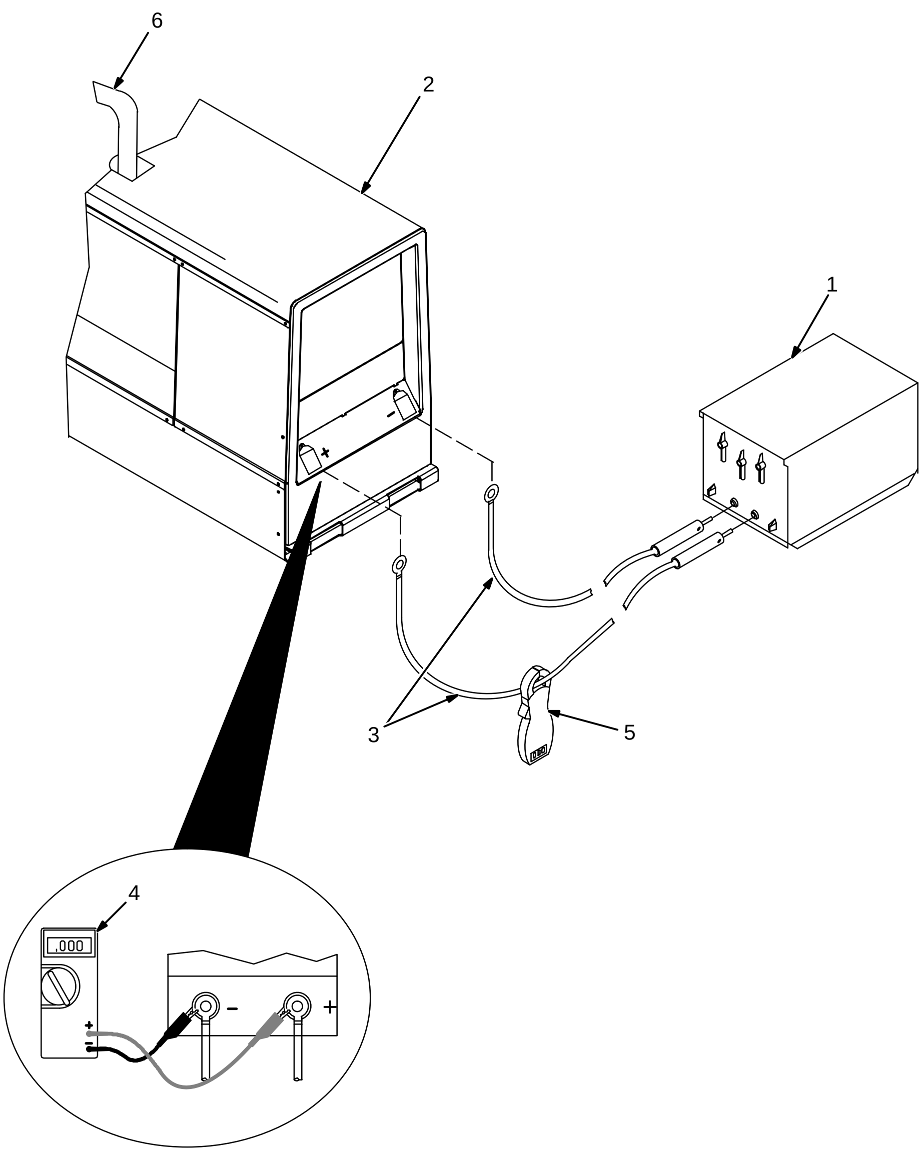
4 Engine Exhaust Pipe

Repeat procedure if wetstacking is present.

S-0683

## 10-3. Run-In Procedure Using Resistance Grid






▲ **Stop engine.**

▲ **Do not touch hot exhaust pipe, engine parts, or load bank/grid.**

▲ **Keep exhaust and pipe away from flammables.**

▲ **Do not perform run-in procedure at less than 20 volts weld output and do not exceed duty cycle or equipment damage may occur.**

1 Resistance Grid

Use grid sized for generator rated output.

Turn Off grid.

2 Welding Generator

3 Weld Cables

Connect grid to generator weld output terminals using proper size weld cables with correct connectors (polarity is not important).

4 Voltmeter

5 Clamp-On Ammeter

Connect voltmeter and ammeter as shown, if not provided on generator.

Start engine and run for several minutes.

Set grid switches and then adjust generator V/A control so load equals 225 amps at 30 volts.

Check generator and meters after first five minutes then every fifteen minutes to be sure generator is loaded properly.

☞ *Check oil level frequently during run-in; add oil if needed.*

After one hour (minimum), place V/A control in minimum position, then shut down grid to remove load. Run engine several minutes at no load.

▲ **Stop engine and let cool.**

6 Engine Exhaust Pipe

Repeat procedure if wetstacking is present.

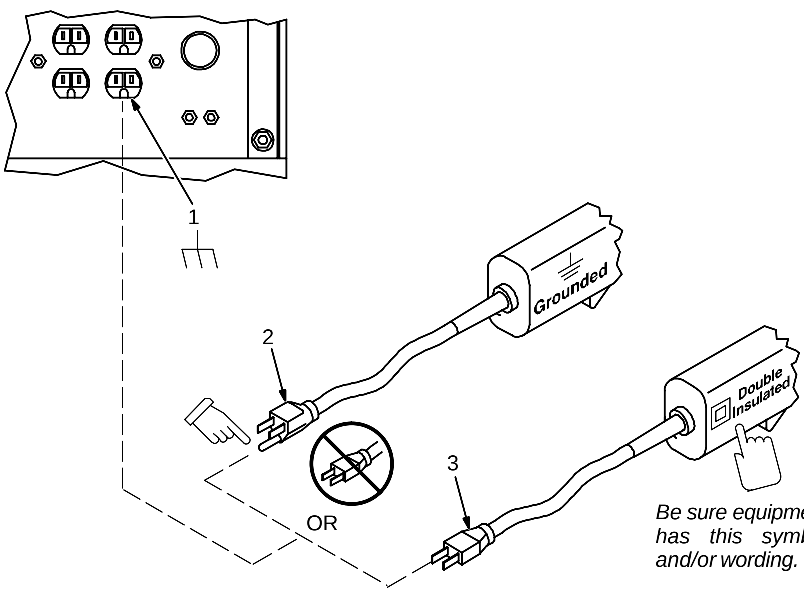
S-0684

# SECTION 11 − GENERATOR POWER GUIDELINES

**NOTE**

*The views in this section are intended to be representative of all engine-driven welding generators. Your unit may differ from those shown.*

## 11-1. Selecting Equipment




*Be sure equipment has this symbol and/or wording.*

1 Generator Power Receptacles − Neutral Bonded To Frame

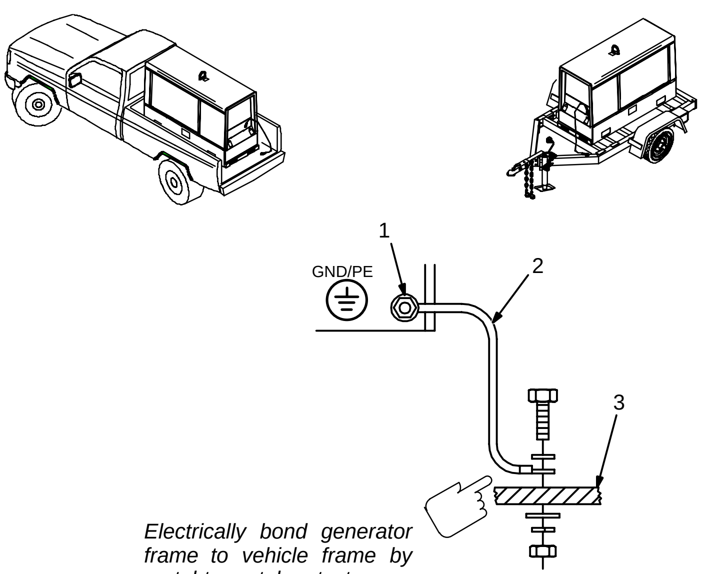
2 3-Prong Plug From Case Grounded Equipment

3 2-Prong Plug From Double Insulated Equipment

▲ **Do not use 2-prong plug unless equipment is double insulated.**

gen_pwr 11/02 − Ref. ST-159 730 / ST-800 577

## 11-2. Grounding Generator To Truck Or Trailer Frame




*Electrically bond generator frame to vehicle frame by metal-to-metal contact.*

▲ **Bed liners, shipping skids, and some running gear insulate the welding generator from the vehicle frame. Always connect a ground wire from the generator equipment grounding terminal to bare metal on the vehicle frame as shown.**

▲ **Always ground generator frame to vehicle frame to prevent electric shock and static electricity hazards.**

1 Equipment Grounding Terminal (On Front Panel)

2 Grounding Cable (Not Supplied)

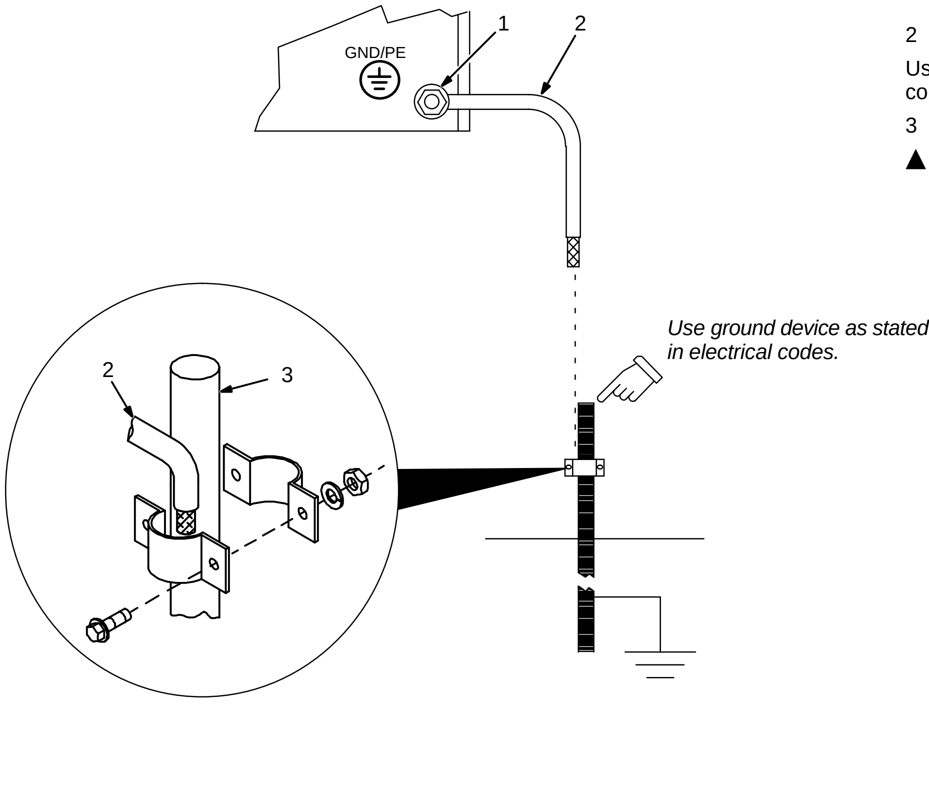
3 Metal Vehicle Frame

Connect cable from equipment ground terminal to metal vehicle frame. Use #10 AWG or larger insulated copper wire.

▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

S-0854

## 11-3. Grounding When Supplying Building Systems




1 Equipment Grounding Terminal

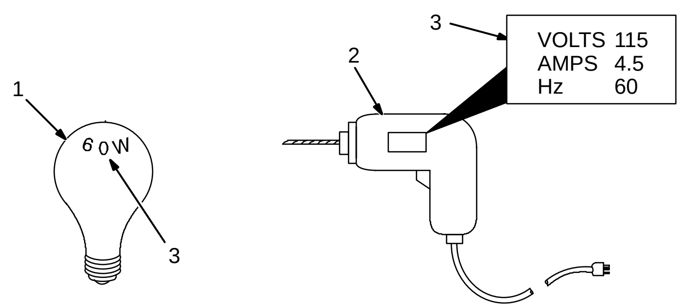
2 Grounding Cable

Use #10 AWG or larger insulated copper wire.

3 Ground Device

▲ **Ground generator to system earth ground if supplying power to a premises (home, shop, farm) wiring system.**

## 11-4. How Much Power Does Equipment Require?




1 Resistive Load

A light bulb is a resistive load and requires a constant amount of power.

2 Non-Resistive Load

Equipment with a motor is a non-resistive load and requires approximately six times more power while starting the motor than when running (see Section 11-8).

3 Rating Data

Rating shows volts and amperes, or watts required to run equipment.

**AMPERES x VOLTS = WATTS**

**EXAMPLE 1:** If a drill uses 4.5 amperes at 115 volts, calculate its running power requirement in watts.

4.5 A x 115 V = 520 W

The load applied by the drill is 520 watts.

**EXAMPLE 2:** If three 200 watt flood lamps are used with the drill from Example 1, add the individual loads to calculate total load.

(200 W + 200 W + 200 W) + 520 W = 1120 W

The total load applied by the three flood lamps and drill is 1120 watts.

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## 11-5. Approximate Power Requirements For Industrial Motors

| Industrial Motors | Rating | Starting Watts | Running Watts |
|---|---|---|---|
| Split Phase | 1/8 HP | 800 | 300 |
| | 1/6 HP | 1225 | 500 |
| | 1/4 HP | 1600 | 600 |
| | 1/3 HP | 2100 | 700 |
| | 1/2 HP | 3175 | 875 |
| Capacitor Start-Induction Run | 1/3 HP | 2020 | 720 |
| | 1/2 HP | 3075 | 975 |
| | 3/4 HP | 4500 | 1400 |
| | 1 HP | 6100 | 1600 |
| | 1-1/2 HP | 8200 | 2200 |
| | 2 HP | 10550 | 2850 |
| | 3 HP | 15900 | 3900 |
| | 5 HP | 23300 | 6800 |
| Capacitor Start-Capacitor Run | 1-1/2 HP | 8100 | 2000 |
| | 5 HP | 23300 | 6000 |
| | 7-1/2 HP | 35000 | 8000 |
| | 10 HP | 46700 | 10700 |
| Fan Duty | 1/8 HP | 1000 | 400 |
| | 1/6 HP | 1400 | 550 |
| | 1/4 HP | 1850 | 650 |
| | 1/3 HP | 2400 | 800 |
| | 1/2 HP | 3500 | 1100 |

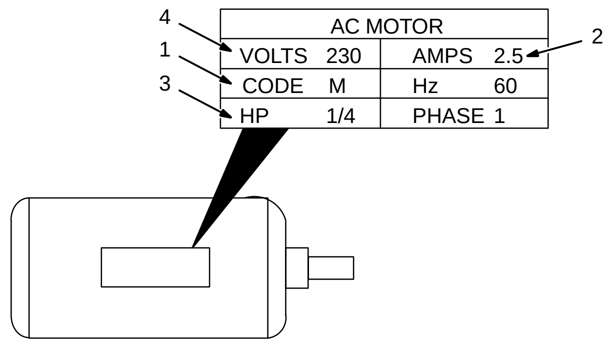
## 11-6. Approximate Power Requirements For Farm/Home Equipment

| Farm/Home Equipment | Rating | Starting Watts | Running Watts |
|---|---|---|---|
| Stock Tank De-Icer | | 1000 | 1000 |
| Grain Cleaner | 1/4 HP | 1650 | 650 |
| Portable Conveyor | 1/2 HP | 3400 | 1000 |
| Grain Elevator | 3/4 HP | 4400 | 1400 |
| Milk Cooler | | 2900 | 1100 |
| Milker (Vacuum Pump) | 2 HP | 10500 | 2800 |
| FARM DUTY MOTORS | 1/3 HP | 1720 | 720 |
| Std. (e.g. Conveyors, | 1/2 HP | 2575 | 975 |
| Feed Augers, Air | 3/4 HP | 4500 | 1400 |
| Compressors) | 1 HP | 6100 | 1600 |
| | 1-1/2 HP | 8200 | 2200 |
| | 2 HP | 10550 | 2850 |
| | 3 HP | 15900 | 3900 |
| | 5 HP | 23300 | 6800 |
| High Torque (e.g. Barn | 1-1/2 HP | 8100 | 2000 |
| Cleaners, Silo Unloaders, | 5 HP | 23300 | 6000 |
| Silo Hoists, Bunk Feeders) | 7-1/2 HP | 35000 | 8000 |
| | 10 HP | 46700 | 10700 |
| 3-1/2 cu. ft. Mixer | 1/2 HP | 3300 | 1000 |
| High Pressure 1.8 Gal/Min | 500 PSI | 3150 | 950 |
| Washer 2 gal/min | 550 PSI | 4500 | 1400 |
| 2 gal/min | 700 PSI | 6100 | 1600 |
| Refrigerator or Freezer | | 3100 | 800 |
| Shallow Well Pump | 1/3 HP | 2150 | 750 |
| | 1/2 HP | 3100 | 1000 |
| Sump Pump | 1/3 HP | 2100 | 800 |
| | 1/2 HP | 3200 | 1050 |

## 11-7. Approximate Power Requirements For Contractor Equipment

| Contractor | Rating | Starting Watts | Running Watts |
|---|---|---|---|
| Hand Drill | 1/4 in | 350 | 350 |
| | 3/8 in | 400 | 400 |
| | 1/2 in | 600 | 600 |
| Circular Saw | 6-1/2 in | 500 | 500 |
| | 7-1/4 in | 900 | 900 |
| | 8-1/4 in | 1400 | 1400 |
| Table Saw | 9 in | 4500 | 1500 |
| | 10 in | 6300 | 1800 |
| Band Saw | 14 in | 2500 | 1100 |
| Bench Grinder | 6 in | 1720 | 720 |
| | 8 in | 3900 | 1400 |
| | 10 in | 5200 | 1600 |
| Air Compressor | 1/2 HP | 3000 | 1000 |
| | 1 HP | 6000 | 1500 |
| | 1-1/2 HP | 8200 | 2200 |
| | 2 HP | 10500 | 2800 |
| Electric Chain Saw | 1-1/2 HP, 12 in | 1100 | 1100 |
| | 2 HP, 14 in | 1100 | 1100 |
| Electric Trimmer | Standard 9 in | 350 | 350 |
| | Heavy Duty 12 in | 500 | 500 |
| Electric Cultivator | 1/3 HP | 2100 | 700 |
| Elec. Hedge Trimmer | 18 in | 400 | 400 |
| Flood Lights | HID | 125 | 100 |
| | Metal Halide | 313 | 250 |
| | Mercury | 1000 | |
| | Sodium | 1400 | |
| | Vapor | 1250 | 1000 |
| Submersible Pump | 400 gph | 600 | 200 |
| Centrifugal Pump | 900 gph | 900 | 500 |
| Floor Polisher | 3/4 HP, 16 in | 4500 | 1400 |
| | 1 HP, 20 in | 6100 | 1600 |
| High Pressure Washer | 1/2 HP | 3150 | 950 |
| | 3/4 HP | 4500 | 1400 |
| | 1 HP | 6100 | 1600 |
| 55 gal Drum Mixer | 1/4 HP | 1900 | 700 |
| Wet & Dry Vac | 1.7 HP | 900 | 900 |
| | 2-1/2 HP | 1300 | 1300 |

## 11-8. Power Required To Start Motor




1 Motor Start Code
2 Running Amperage
3 Motor HP
4 Motor Voltage

To find starting amperage:

**Step 1:** Find code and use table to find kVA/HP. If code is not listed, multiply running amperage by six to find starting amperage.

**Step 2**: Find Motor HP and Volts.

**Step 3:** Determine starting amperage (see example).

Welding generator amperage output must be at least twice the motor's running amperage.

**Single-Phase Induction Motor Starting Requirements**

| **Motor Start Code** | G | H | J | K | L | M | N | P |
|---|---|---|---|---|---|---|---|---|
| **KVA/HP** | 6.3 | 7.1 | 8.0 | 9.0 | 10.0 | 11.2 | 12.5 | 14.0 |

$$\frac{\textbf{kVA/HP x HP x 1000}}{\textbf{VOLTS}} = \textbf{STARTING AMPERAGE}$$

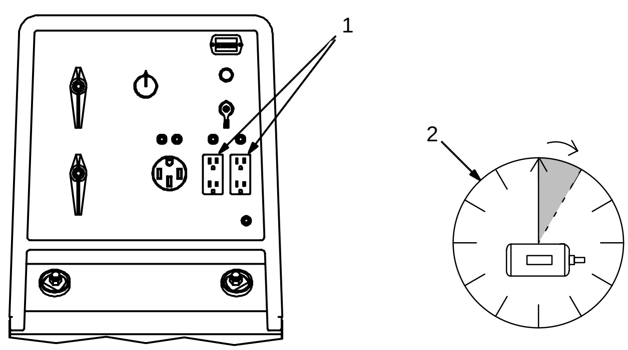
**EXAMPLE:** Calculate the starting amperage required for a 230 V, 1/4 HP motor with a motor start code of M.

Volts = 230 HP = 1/4 Using Table, Code M results in kVA/HP = 11.2

$$\frac{11.2 \times 1/4 \times 1000}{230} = 12.2\ \text{A}$$ **Starting the motor requires 12.2 amperes.**

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## 11-9. How Much Power Can Generator Supply?




1 Limit Load To 90% Of Generator Output

Always start non-resistive (motor) loads in order from largest to smallest, and add resistive loads last.

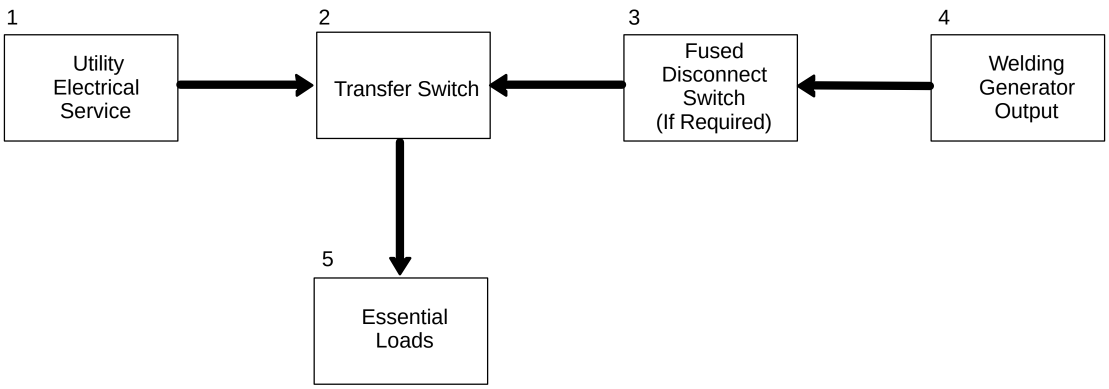
2 5 Second Rule

If motor does not start within 5 seconds, turn off power to prevent motor damage. Motor requires more power than generator can supply.

Ref. ST-800 396-A / S-0625

## 11-10. Typical Connections To Supply Standby Power

▲ **Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.**




▲ **Have only qualified persons perform these connections according to all applicable codes and safety practices.**

▲ **Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.**

☞ *Customer-supplied equipment is required if generator will supply standby power during emergencies or power outages.*

1 Utility Electrical Service

2 Transfer Switch (Double-Throw)

Switch transfers the electrical load from electric utility service to the generator. Transfer load back to electric utility when service is restored.

Install correct switch (customer-supplied). Switch rating must be same as or greater than the branch overcurrent protection.

3 Fused Disconnect Switch

Install correct switch (customer-supplied) if required by electrical code.

4 Welding Generator Output

Generator output voltage and wiring must be consistent with regular (utility) system voltage and wiring.

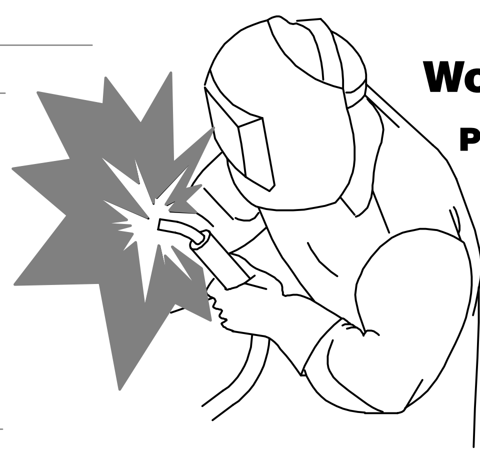
Connect generator with temporary or permanent wiring suitable for the installation.

Turn off or unplug all equipment connected to generator before starting or stopping engine. When starting or stopping, the engine has low speed which causes low voltage and frequency.

5 Essential Loads

Generator output may not meet the electrical requirements of the premises. If generator does not produce enough output to meet all requirements, connect only essential loads (pumps, freezers, heaters, etc. − See Section 11-4).

# Notes



**Work like a Pro!**

**Pros weld and cut safely. Read the safety rules at the beginning of this manual.**

## 11-11. Selecting Extension Cord (Use Shortest Cord Possible)



**Cord Lengths for 120 Volt Loads**

▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

| Current (Amperes) | Load (Watts) | Maximum Allowable Cord Length in ft (m) for Conductor Size (AWG)* | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 | 6 | 8 | 10 | 12 | 14 |
| 5 | 600 | | | 350 (106) | 225 (68) | 137 (42) | 100 (30) |
| 7 | 840 | | 400 (122) | 250 (76) | 150 (46) | 100 (30) | 62 (19) |
| 10 | 1200 | 400 (122) | 275 (84) | 175 (53) | 112 (34) | 62 (19) | 50 (15) |
| 15 | 1800 | 300 (91) | 175 (53) | 112 (34) | 75 (23) | 37 (11) | 30 (9) |
| 20 | 2400 | 225 (68) | 137 (42) | 87 (26) | 50 (15) | 30 (9) | |
| 25 | 3000 | 175 (53) | 112 (34) | 62 (19) | 37 (11) | | |
| 30 | 3600 | 150 (46) | 87 (26) | 50 (15) | 37 (11) | | |
| 35 | 4200 | 125 (38) | 75 (23) | 50 (15) | | | |
| 40 | 4800 | 112 (34) | 62 (19) | 37 (11) | | | |
| 45 | 5400 | 100 (30) | 62 (19) | | | | |
| 50 | 6000 | 87 (26) | 50 (15) | | | | |

*Conductor size is based on maximum 2% voltage drop

**Cord Lengths for 240 Volt Loads**

▲ **If unit does not have GFCI receptacles, use GFCI-protected extension cord.**

| Current (Amperes) | Load (Watts) | Maximum Allowable Cord Length in ft (m) for Conductor Size (AWG)* | | | | | |
|---|---|---|---|---|---|---|---|
| | | 4 | 6 | 8 | 10 | 12 | 14 |
| 5 | 1200 | | | 700 (213) | 450 (137) | 225 (84) | 200 (61) |
| 7 | 1680 | | 800 (244) | 500 (152) | 300 (91) | 200 (61) | 125 (38) |
| 10 | 2400 | 800 (244) | 550 (168) | 350 (107) | 225 (69) | 125 (38) | 100 (31) |
| 15 | 3600 | 600 (183) | 350 (107) | 225 (69) | 150 (46) | 75 (23) | 60 (18) |
| 20 | 4800 | 450 (137) | 275 (84) | 175 (53) | 100 (31) | 60 (18) | |
| 25 | 6000 | 350 (107) | 225 (69) | 125 (38) | 75 (23) | | |
| 30 | 7000 | 300 (91) | 175 (53) | 100 (31) | 75 (23) | | |
| 35 | 8400 | 250 (76) | 150 (46) | 100 (31) | | | |
| 40 | 9600 | 225 (69) | 125 (38) | 75 (23) | | | |
| 45 | 10,800 | 200 (61) | 125 (38) | | | | |
| 50 | 12,000 | 175 (53) | 100 (31) | | | | |

*Conductor size is based on maximum 2% voltage drop

# SECTION 12 − PARTS LIST

☞ *Hardware is common and not available unless listed.*

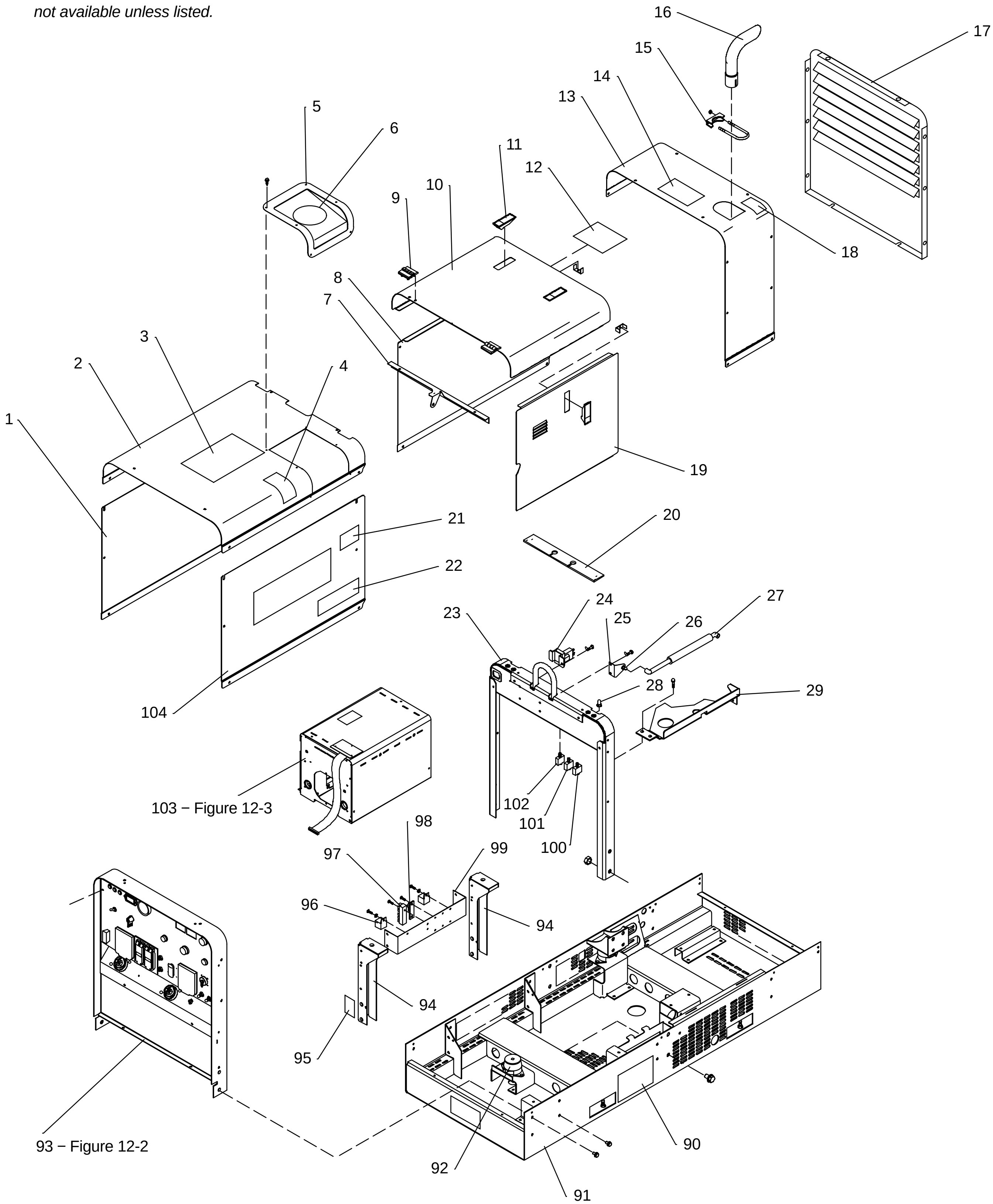
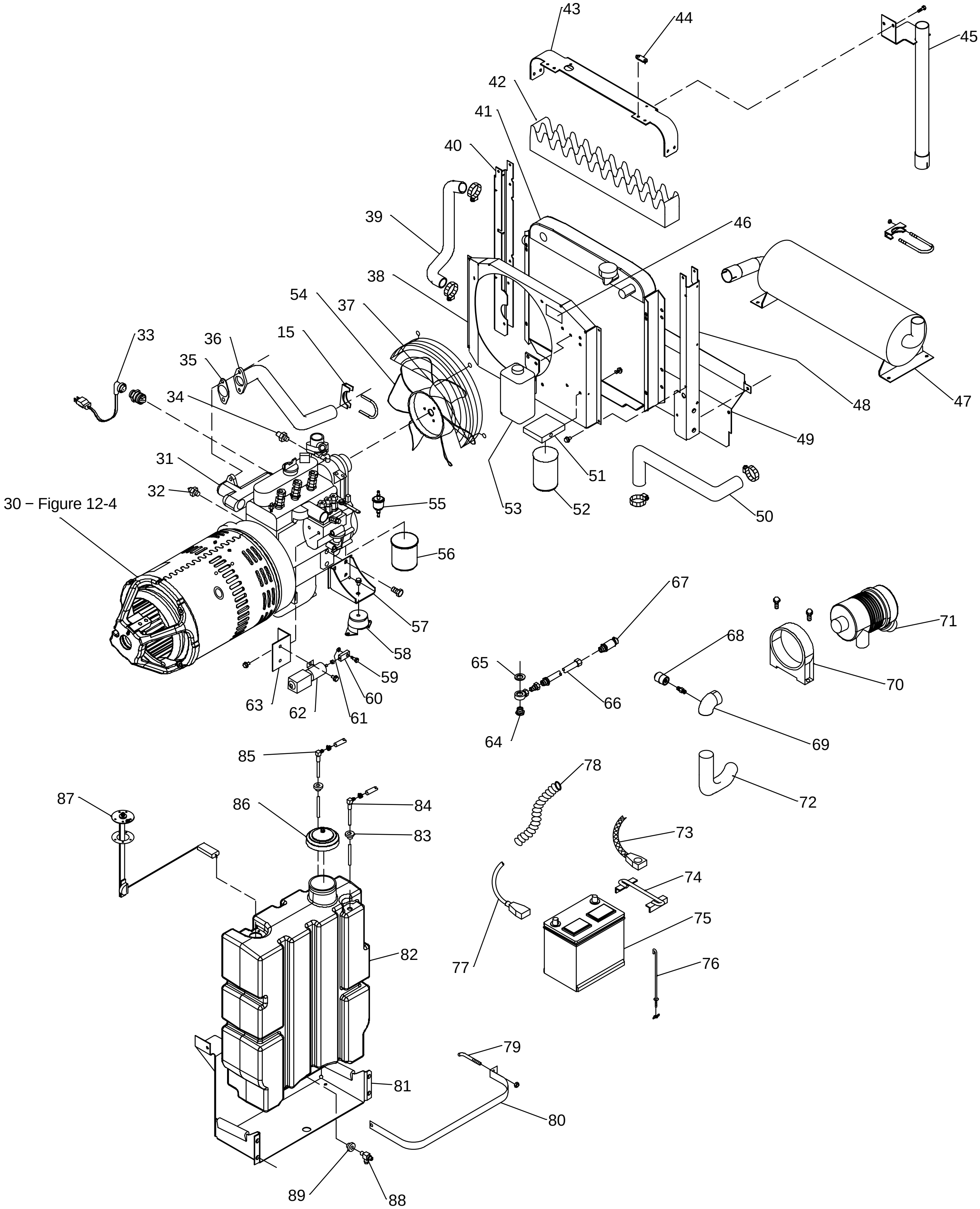



**Figure 12-1. Main Assembly**


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802 324-H

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|

**Figure 12-1. Main Assembly**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| 1 | | +198 157 | PANEL, generator left | 1 |
| 1 | | ♦+198 873 | PANEL, generator left stainless | 1 |
| 2 | | +198 155 | COVER, generator | 1 |
| 2 | | +♦198 871 | COVER, generator stainless | 1 |
| | | ♦163163 | SCREW, 250−20x .50 Hex Hd−pln Stainless Pln T18−8 302−305 | 37 |
| | | ♦163175 | SCREW, 250−20x .75 Hex Hd−pln Stainless Pln T18−8 302−305 | As Rqd. |
| | | ♦163167 | WASHER, Lock .254idx0.489odx.062t Stainless Split.250 | 37 |
| | | ♦163174 | WASHER, Flat .281idx0.625odx.050t Stainless | 37 |
| 3 | | 200 795 | LABEL, warning general precautionary CSA | 1 |
| 4 | | 107 990 | LABEL, use diesel fuel only | 1 |
| 5 | | 198 159 | TRAY, fuel spill | 1 |
| 6 | | 200 366 | EDGE TRIM, style 70−p−11 nitrile rubber x roll | 2 ft |
| 7 | | 193 411 | BRACE, hood access rear | 1 |
| 8 | | 198 156 | DOOR, access | 1 |
| 8 | | ♦198 872 | DOOR, access stainless | 1 |
| 9 | | 198 525 | HINGE, door access 180deg | 2 |
| 10 | | +198 164 | HOOD, access | 1 |
| 10 | | +♦198 878 | HOOD, access stainless | 1 |
| 11 | | 194 320 | LATCH, door access | 3 |
| 12 | | 194 295 | LABEL, engine maintenance | 1 |
| 13 | | 198 162 | PLENUM, radiator cover | 1 |
| 13 | | ♦198 875 | PLENUM, radiator cover stainless | 1 |
| 14 | | 200 448 | LABEL, warning steam and hot coolant | 2 |
| 15 | | 109 591 | CLAMP, muffler 1.750dia | 3 |
| 16 | | 201 882 | PIPE, exhaust elbow 1.654 ID stainless | 1 |
| 17 | | 198 153 | PANEL, rear | 1 |
| 18 | | 176 230 | LABEL, hot exhaust | 1 |
| 19 | | 198 154 | DOOR, access removable | 1 |
| 19 | | ♦198 870 | DOOR, access removable stainless | 1 |
| 20 | | 209 344 | SEAL, lifting eye | 1 |
| 21 | | 090 281 | LABEL, caution do not use ether | 1 |
| 22 | | 168 385 | LABEL, warning battery explosion can blind | 1 |
| 23 | | 198 054 | UPRIGHT, base center | 1 |
| 24 | CR2 | 155 309 | CONTACTOR, solenoid 12VDC continuous 400 A | 1 |
| 25 | | 193 414 | BRACKET, mtg gas spring front | 1 |
| 26 | | 172 296 | BALL GAS SPRING, stud .39dia | 2 |
| 27 | | 192 239 | SPRING, pressure gas | 1 |
| 28 | | 206 795 | BOOT, circuit breaker clear hex nut | 3 |
| 29 | | 197 265 | BRACKET, mtg air cleaner and stop door access | 1 |
| 30 | | Figure 12-4 | GENERATOR ASSEMBLY | 1 |
| 31 | | 193 624 | ENGINE, Kubota dsl elec (consisting of) | 1 |
| 32 | S2 | *197 145 | . . SWITCH, oil pressure 7 psi no screw terminal (included w/engine) | 1 |
| | | 114 923 | BOOT, insulator term post red (for starter and alternator terminals) | 2 |
| 33 | | 200 653 | HEATER, block engine 120v 400w kabota 905 | 1 |
| 34 | S3 | 205 800 | SWITCH, thermo temp 230deg ±5deg F NO | 1 |
| 35 | | 192 517 | GASKET, exhaust manifold | 1 |
| 36 | | 192 194 | PIPE, exhaust flexible inlet | 1 |
| 37 | | 191 693 | GUARD, fan | 1 |
| 38 | | +202 243 | SHROUD, fan | 1 |
| 39 | | 191 341 | HOSE, radiator outlet | 1 |
| 40 | | 198 186 | BRACKET, mtg radiator LH | 1 |
| 41 | | 197 822 | RADIATOR, w/14# cap 3 row core 1.125 inlet/outlet | 1 |
| 42 | | 194 578 | BAFFLE, air foam | 1 |
| 43 | | 198 181 | RADIATOR ARCH | 1 |
| 44 | | 191 626 | BUMPER, door access | 2 |
| 45 | | 192 195 | PIPE, exhaust outlet | 1 |
| 46 | | 182 092 | LABEL, warning moving parts | 2 |
| 47 | | 201 528 | MUFFLER, exhaust | 1 |
| 48 | | 198 187 | BRACKET, mtg radiator RH | 1 |
| 49 | | 198 185 | BAFFLE, lower radiator | 1 |
| 50 | | 191 342 | HOSE, radiator inlet | 1 |

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|

**Figure 12-1. Main Assembly (Continued)**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| 51 | | 202 198 | BASE, fuel filter | 1 |
| 52 | | *192 744 | FILTER, fuel spin-on | 1 |
| 53 | | 187 462 | BOTTLE, overflow w/cap and hose | 1 |
| | | 208 124 | .. CAP, w/gasket overflow bottle | 1 |
| | | 192 934 | BRACKET, mtg coolant recovery tank | 1 |
| 54 | | 197 146 | FAN, engine 330mm pusher kubota | 1 |
| 55 | | *066 113 | FILTER, fuel inline .250 | 1 |
| 56 | | *196 428 | FILTER, oil | 1 |
| 57 | | 192 475 | SUPPORT, engine | 2 |
| 58 | | 192 476 | MOUNT, engine vibration | 2 |
| 59 | | 118 829 | SCREW, shld stl sch .312-18 x .500 x .375 | 1 |
| 60 | | 194 127 | LINKAGE, throttle solenoid | 1 |
| 61 | | 145 675 | NUT, .312-18 x .50 hex .37h stl pld deformed | 1 |
| 62 | | 192 196 | SOLENOID, 12VDC 46A push/hold (throttle) | 1 |
| 63 | | 192 663 | BRACKET, mtg solenoid | 1 |
| 64 | | 047 234 | BOLT, banjo | 1 |
| 65 | | 047 235 | WASHER, seal oil copper .879 ID x 1.059 OD | 1 |
| 66 | | 203 897 | HOSE, oil w/fittings 22.500 lg | 1 |
| 67 | | 165 271 | VALVE, oil drain 3/8-18 NPTF | 1 |
| 68 | | 209 329 | INDICATOR, restriction air | 1 |
| 69 | | 197 256 | HOSE, elbow air cleaner | 1 |
| 70 | | 193 026 | BAND, mtg air cleaner case | 1 |
| 71 | | 192 188 | AIR CLEANER, intake 90deg outlet 4.25 in dia | 1 |
| | | *187 441 | ELEMENT, air cleaner | 1 |
| | | ♦202 102 | ELEMENT, air cleaner safety | 1 |
| 72 | | 197 227 | HOSE, elbow air intake | 1 |
| 73 | | 032 453 | CABLE, bat neg 24.375 No. 2 awg w/clamp and .375 rng | 1 |
| 74 | | 204 875 | HOLD DOWN, battery | 1 |
| 75 | | 146 237 | BATTERY, stor 12V 535crk 90rsv gp 55 | 1 |
| 76 | | 494 604 | BOLT, j stl .250−20 x 8.000 pld w/nuts&washers | 2 |
| 77 | | 182 276 | CABLE, bat pos 28.000 No. 1 awg w/clamp and .406 lug | 1 |
| 78 | | 110 465 | TUBING, corrugated plastic slit .500 dia xcoil | 2.1 ft |
| | | 108 081 | TERMINAL PROTECTOR, battery post mtg | 2 |
| 79 | | 097829 | BOLT, J Stl .250−20 X 2.750 Pld | 1 |
| 80 | | 200 407 | STRAP, Fuel Tank | 1 |
| 81 | | 198 168 | SUPPORT, Fuel Tank/Weld Components | 1 |
| 82 | | 198 180 | TANK, Fuel 13.1 Gal (Consisting Of) | 1 |
| 83 | | 124 253 | .. BUSHING, Tank Fuel | 2 |
| 84 | | 198 510 | .. FTG, Stand Pipe Hose .3125 X24.570lg 90 Deg Zinc | 1 |
| 85 | | 198 511 | .. FTG, Stand Pipe Hose .1875x24.570lg 90 Deg Zinc | 1 |
| 86 | | 190 198 | .. CAP, Tank Screw−on 3.500 In W/Vent | 1 |
| 87 | | 198 512 | .. SENDER, Fuel Gauge 22.500 Deep Tank | 1 |
| 88 | | 189 908 | .. VALVE, Drain Fuel 180 Deg Zinc Pld | 1 |
| 89 | | 181 572 | .. BUSHING, Tank Fuel | 1 |
| 90 | | 197 930 | LABEL, warning do not weld on base | 2 |
| 91 | | 197 835 | BASE | 1 |
| 92 | | 192 477 | MOUNT, engine vibration | 1 |
| 93 | | Figure 12-2 | FRONT PANEL ASSEMBLY | 1 |
| 94 | | 198 167 | SUPPORT, inverter chassis | 2 |
| 95 | | 190 861 | LABEL, electric shock and moving parts | 1 |

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| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| | | | **Figure 12-1. Main Assembly (Continued)** | |
| | | 213 226 | .. HARNESS, wiring ignition (consisting of) | 1 |
| .. 96 | CR1, CR2 | 173 069 | .... RELAY, encl 12VDC SPDT 30A/20A 5 pin flange mtg | 2 |
| .. 97 | | 197 147 | .... BLOCK, term 5-4-3 | 1 |
| .. 98 | D3 | 135 184 | .... DIODE BOARD | 1 |
| .. 99 | | 191 735 | .... STRIP, mtg components | 1 |
| | | 148 850 | .... SOCKET, relay 5 pin | 2 |
| | PLG26 | 135 275 | .... CONNECTOR, rect univ 084 15P/S 3 row plug (service kit) | 1 |
| | PLG5 | 166 680 | .... CONNECTOR, rect univ 084 12P/S 3 row plug (service kit) | 1 |
| | PLG8 | 177 859 | .... CONNECTOR, body 5 terminal | 1 |
| | PLG34 | 153 501 | .... CONNECTOR, rect univ 039 6P/S 3 row plug (service kit) | 2 |
| | S6 | 021 467 | .... SWITCH, tgl spst 3a 250v off−none−(on) spd term | 1 |
| | | 187 654 | .... SEAL, wire univ 12p/s 3row | 1 |
| | | 187 655 | .... SEAL, wire univ 15p/s 3row | 1 |
| | | 208 871 | .. HARNESS, wiring engine compartment (consisting of) | 1 |
| | RC5 | 158 466 | .... CONNECTOR, rect univ 084 12P/S 3 row rcpt | 1 |
| | PLG38 | 192 170 | .... CONNECTOR, rect 250 2skt 1 row plug | 1 |
| | | 192 169 | .... CONNECTOR, rect 250 1skt 1 row plug | 1 |
| | PLG36 | 192 171 | .... CONNECTOR, rect 250 3skt 1 row plug | 1 |
| | PLG37 | 192 168 | .... CONNECTOR, rect 250 1 pin 1 row rcpt | 1 |
| | PLG39 | 092 670 | .... CONNECTOR, rect univ 084 3P/S 1 row plug | 1 |
| | | 192 167 | .... SEAL, wire univ 3P/S 1 row | 1 |
| . 100 | CB7 | 147 658 | .... CIRCUIT BREAKER, man rest 1P 30A 250VAC screw (see Figure 12-1) | 1 |
| . 101 | CB8 | 115 427 | .... CIRCUIT BREAKER, man reset 1P 25A 250VAC frict (see Figure 12-1) | 1 |
| . 102 | CB10 | 139 266 | .... CIRCUIT BREAKER, man reset 1P 15A 250VAC frict (see Figure 12-1) | 1 |
| | | 187 654 | .... SEAL, wire univ 12p/s 3row | 1 |
| | | 148 850 | .... SOCKET, relay 5 pin (for CR3) | 1 |
| . 103 | | Figure 12-3 | .. INVERTER ASSEMBLY | 1 |
| . 104 | | 198 158 | .. PANEL, generator right | 1 |
| . 104 | | ♦198 874 | .. PANEL, generator right stainless | 1 |
| | | 194 126 | .. KIT, foam | 1 |

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
*Recommended Spare Parts.
♦ Optional

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☞ *Hardware is common and not available unless listed.*

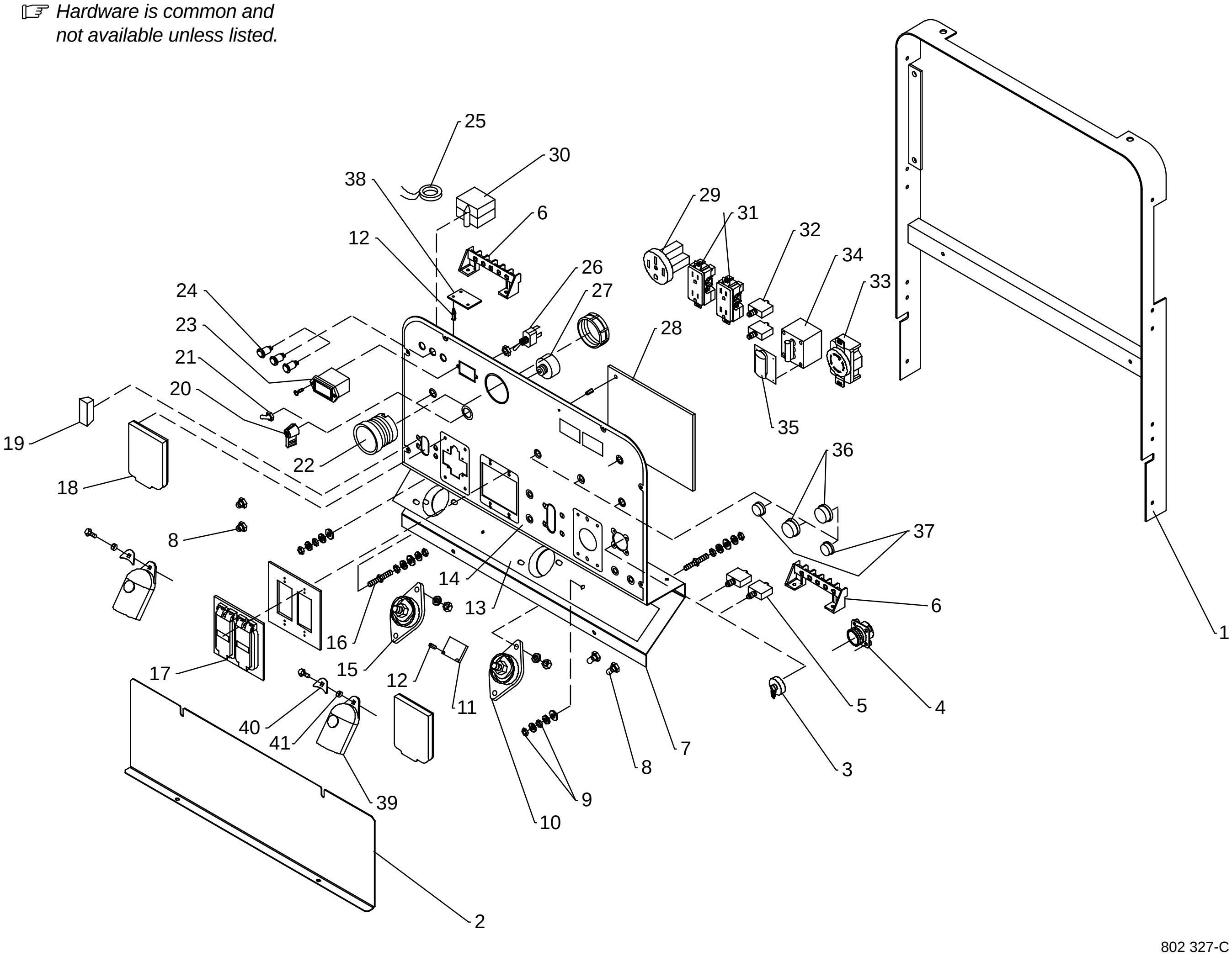



**Figure 12-2. Front Panel**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| | | | **Figure 12-2. Front Panel (Figure 12-1, Item 93)** | |
| 1 | | 198 049 | UPRIGHT, base front | 1 |
| 2 | | +191 737 | PANEL, front louver | 1 |
| 3 | | 170 391 | CONN, circ ms protective cap | 1 |
| | | 213 225 | RECEPTACLE/CIRCUIT BREAKERS with leads (consisting of) | 1 |
| 4 | RC5 | 143 976 | .. CONNECTOR, circ MS/CPC 14skt sz 20 rcpt panel push-in (service kit) | 1 |
| | PLG13 | 115 091 | .. CONNECTOR, rect mini 045 10skt 2 row plug (service kit) | 1 |
| 5 | CB5,CB6 | 083 432 | .. CIRCUIT BREAKER, man reset 1P 10A 250VAC frict | 2 |
| 6 | 2T, 3T | 172 661 | BLOCK, stud connection 6 position | 2 |
| 7 | | 212 480 | PANEL, front | 1 |
| 8 | | 206 795 | BOOT, circuit breaker clear hex nut | 4 |
| 9 | | 601 836 | NUT, 250-20 .50hex .19H brs | 8 |
| 10 | | 039 046 | TERMINAL, pwr output black | 1 |
| 11 | PC10 | 148 608 | CIRCUIT CARD ASSEMBLY, filter HF | 1 |
| 12 | | 134 201 | STAND−OFF SUPPORT, pc card .312/.375w/post&lock .43 | 6 |
| 13 | | | PLATE, lower (order by model & serial number) | 1 |
| 14 | | | NAMEPLATE, upper (order by model & serial number) | 1 |
| 15 | | 039 047 | TERMINAL, pwr output red | 1 |
| 16 | | 083 030 | STUD, brs .250-20 x 1.750 w/hex collar | 2 |
| 17 | | 213 456 | COVER, receptacle duplex dual gfci weather proof | 1 |
| 18 | | 209 056 | COVER, receptacle w/ gasket | 2 |
| 19 | | 203 016 | BOOT, circuit breaker 2 pole | 1 |
| 20 | | 119 014 | LEVER, switch black | 1 |
| 21 | | 021 385 | BOOT, tgl switch lever | 1 |

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| | | | **Figure 12-2. Front Panel (Continued)** | |
| 22 | | 192 265 | GAUGE, fuel elec switch w/o switchgage sensor | 1 |
| 23 | | 145 247 | METER, hour 12−24vdc 1.25 x 2.12 rect | 1 |
| 24 | PL1, PL2, PL3 | 206 879 | LIGHT, ind amber lens 12v snap−in mtg .500 mtg hol | 1 |
| 25 | CT2 | 192 237 | TRANSFORMER, current | 1 |
| 26 | S4 | 108 024 | SWITCH, tgl DPST mc 15A 125VAC friction | 1 |
| 27 | S1 | 176 606 | SWITCH, ignition 4posn w/o handle | 1 |
| 28 | PC3 | 196 156 | CIRCUIT CARD ASSEMBLY, front panel | 1 |
| | | 210 844 | SHIELD, pcb protective anti static 6.338x11.000 | 1 |
| 29 | RC1 | 182 954 | RECEPTACLE, str 3P4W 50A 125/250V (single-phase) | 1 |
| | | ♦119 172 | PLUG, str grd 3p4w 50a 125/250v *14−50p (for RC1) | 1 |
| 30 | CB3 | 203 026 | CIRCUIT BREAKER, man reset 2p 50a 240vac screw−90 | 1 |
| 31 | RC2, RC3 | 214 918 | RECEPTACLE, str dx grd 2p3w 20a 125v *5−20r | 2 |
| | GFCI-1, 2 | ♦151 981 | RECEPTACLE, Str Dx Grd 2p3w 15/20a 125v *5−20r Gfi | 2 |
| 32 | CB2,CB3 | 093 996 | CIRCUIT BREAKER, man reset 1P 20A 250VAC frict | 2 |
| 33 | RC4 | 007 469 | RECEPTACLE, twlk grd 3P4W 30A 250V (3-phase) | 1 |
| | | ♦007 470 | PLUG, tw lk grd 3p4w 30a 250v *l15−30p (For RC4) | 1 |
| 34 | CB4 | 192 565 | CIRCUIT BREAKER, man reset 3P 30A 250VAC | 1 |
| 35 | | 203 017 | BOOT, circuit breaker 3 pole | 1 |
| 36 | | 174 991 | KNOB, pointer 1.250dia x .250 ID w/spring clip | 2 |
| 37 | | 174 992 | KNOB, pointer .820dia x .250 ID w/spring clip | 2 |
| 38 | PC9 | 181 261 | CIRCUIT CARD ASSY, filter hf | 1 |
| 39 | | 186 621 | BOOT, generic output stud | 2 |
| 40 | | 181 169 | SPACER, output stud | 2 |
| 41 | | 180 735 | WASHER, output stud | 2 |

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
*Recommended Spare Parts.
♦ Optional

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☞ *Hardware is common and not available unless listed.*

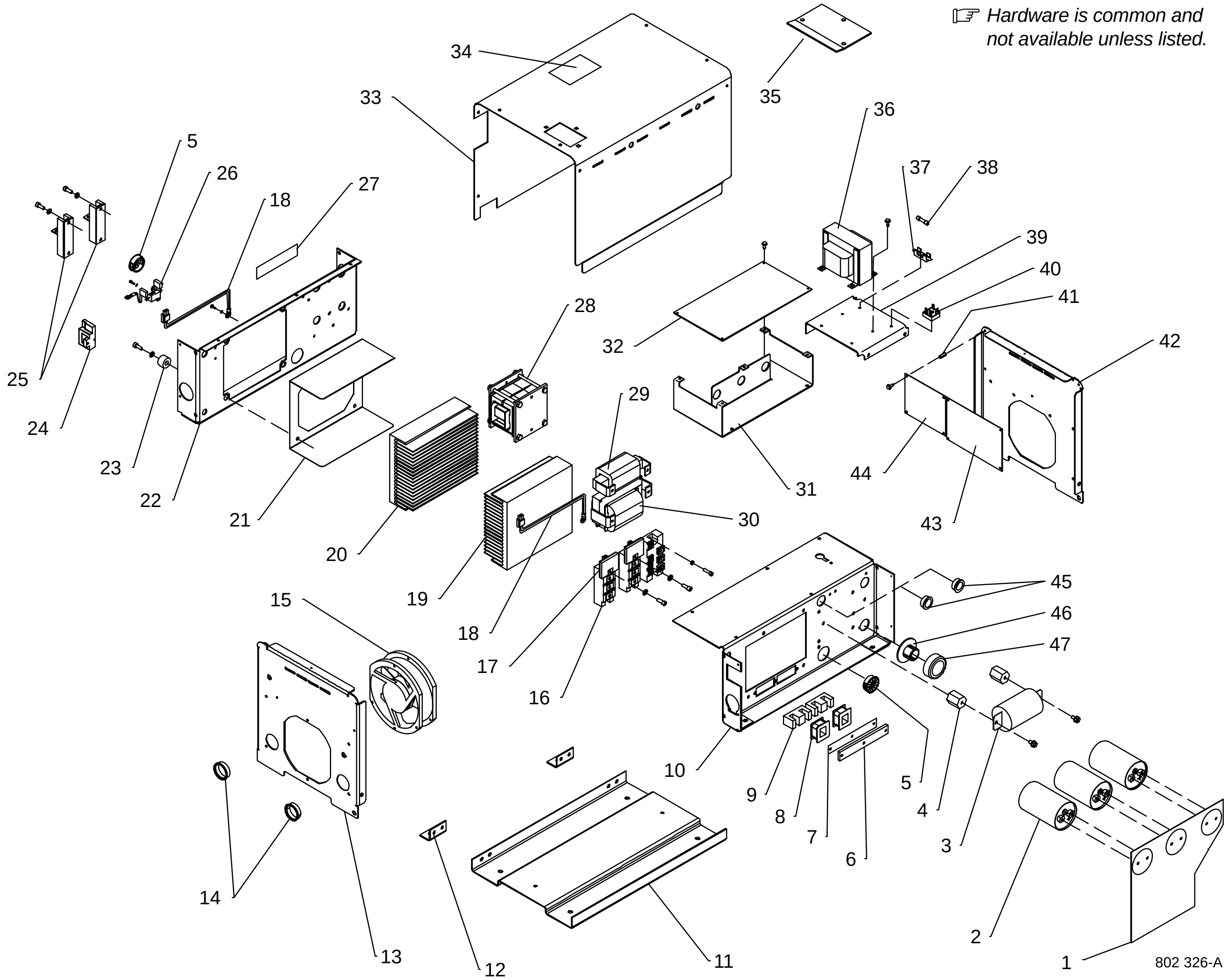



**Figure 12-3. Inverter Assembly**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| **Figure 12-3. Inverter Assembly (Figure 12-1, Item 103)** | | | | |
| 1 | PC2 | 196 148 | CIRCUIT CARD ASSEMBLY, interconnecting | 1 |
| 2 | C3,C4,C5 | 192 935 | CAPACITOR, elctlt 2700uf 450 | 3 |
| 3 | C1 | 186 015 | CAPACITOR, polyp film .34uf | 1 |
| 4 | | 025 248 | STAND-OFF, insul .250-20 x 1.2 | 2 |
| 5 | | 179 276 | BUSHING, snap-in nyl 1.000 | 1 |
| 6 | | 175 140 | BRACKET, DI/DT | 1 |
| 7 | | 181 197 | GASKET, DI/DT rubber | 1 |
| 8 | L3,L4 | 175 482 | COIL, DI/DT | 2 |
| 9 | | 109 056 | CORE, ferrite E 2.164 lg x 1.09 | 2 |
| 10 | | 185 731 | WINDTUNNEL, RH | 1 |
| 11 | | 189 755 | BASE | 1 |
| 12 | | 191 568 | FOOT, mtg unit | 2 |
| 13 | | 200 649 | PANEL, front | 1 |
| 14 | | 170 647 | BUSHING, snap-in 1.312 ID | 2 |
| 15 | | 175 084 | MOTOR, fan 24VDC 3000RPM | 1 |
| 16 | SR1 | 179 629 | KIT, diode power module | 1 |
| 17 | PM1,PM2 | 180 110 | KIT, transistor IGBT module | 2 |
| 18 | RT1,RT2 | 173 632 | THERMISTOR, NTC 30K ohm at 25D C | 2 |
| 19 | | 173 631 | HEAT SINK, power module | 1 |
| 20 | | 175 192 | HEAT SINK, rect | 1 |
| 21 | | 175 255 | INSULATOR, rectifier | 1 |
| 22 | | +183 551 | WINDTUNNEL, LH | 1 |

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| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|

**Figure 12-3. Inverter Assembly (Continued)**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| 23 | | 181 853 | INSULATOR, screw | 4 |
| 24 | HD1 | 189 567 | TRANSDUCER, current 400A | 1 |
| 25 | D1,D2 | 179 630 | KIT, diode ultra-fast recovery | 2 |
| 26 | R1,C6,C7 | 175 194 | RESISTOR/CAPACITOR | 1 |
| 27 | | 185 835 | LABEL, warning electric shock | 2 |
| 28 | T1 | 173 811 | TRANSFORMER, HF 230/460 | 1 |
| 29 | L1 | 173 563 | INDUCTOR, input | 1 |
| 30 | Z1 | 189 525 | STABILIZER, output | 1 |
| 31 | | 189 420 | BRACKET, mtg capacitor/PC board | 1 |
| 32 | PC1 | 212 691 | CIRCUIT CARD ASSEMBLY, control | 1 |
| 33 | | +213 412 | WRAPPER, inverter chassis | 1 |
| 34 | | 190 861 | LABEL, electric shock and moving parts | 1 |
| 35 | | 200 590 | COVER, ribbon access | 1 |
| 36 | T2 | 189 481 | TRANSFORMER, control 300VA 230VAC pri | 1 |
| 37 | | 172 731 | HOLDER, fuse mintr .250 x 1.250 clip anti−pivot | 1 |
| 38 | F1 | 169 296 | FUSE, mintr gl 25. amp 125 volt | 1 |
| 39 | | 189 422 | BRACKET, mtg transformer control | 1 |
| 40 | SR2 | 035 704 | RECTIFIER, integ bridge 40. amp 800v | 1 |
| 41 | | 115 440 | STAND-OFF, No. 6-32 x .687 lg | 8 |
| 42 | | 200 651 | PANEL, rear | 1 |
| 43 | PC8 | 213 231 | CIRCUIT CARD ASSEMBLY, voltage regulator | 1 |
| 44 | PC7 | 203 130 | CIRCUIT CARD ASSY, gen power (includes) | 1 |
| | F1 | 027660 | FUSE, Mintr Cer 20. Amp 250 Volt | 1 |
| 45 | | 153 403 | BUSHING, snap-in nyl .750 ID | 2 |
| 46 | | 177 547 | BUSHING, snap-in nyl ct-mount | 1 |
| 47 | CT1 | 175 199 | TRANSFORMER, current | 1 |
| | | 213 410 | HARNESS, wiring unit (consisting of) | 1 |
| | RC26 | 147 663 | CONNECTOR, rect univ 084 15 p/s 3 row rectp lkg (service kit) | 1 |
| | RC25 | 116 045 | CONNECTOR, rect univ 084 6p/s 3 row rcpt lkg (service kit) | 1 |
| | PLG24, PLG44 | 115 094 | CONNECTOR, rect mini 045 4skt 2 row plug (service kit) | 1 |
| | RC10, PLG31 | 168 071 | CONNECTOR, rect univ 084 9P/S 3 row rcpt (service kit) | 1 |
| | PLG2 | 115 091 | CONNECTOR, rect mini 045 10skt 2 row plug (service kit) | 1 |
| | PLG23 | 130 203 | CONNECTOR, rect mini 045 12 skt 2 row plug (service kit) | 1 |
| | RC24 | 047 483 | CONNECTOR, rect univ 084 15P/S 3 row rcpt (service kit) | 1 |
| | PLG50 | 136 810 | CONNECTOR, rect univ 084 4p/s 1 row plug cable lkg (service kit) | 1 |
| | PLG43 | 115 093 | CONNECTOR, rect mini 045 6skit 2row plg cable lkg (service kit) | 1 |
| | PLG21 | 115 092 | CONNECTOR, rect mini 045 8skt 2row plug cable lkg (service kit) | 1 |
| | PLG22 | 131 204 | CONNECTOR, rect mini 045 3skt 1row plug cable lkg (service kit) | 1 |
| | PLG9 | 183 046 | CABLE, LEM | 1 |

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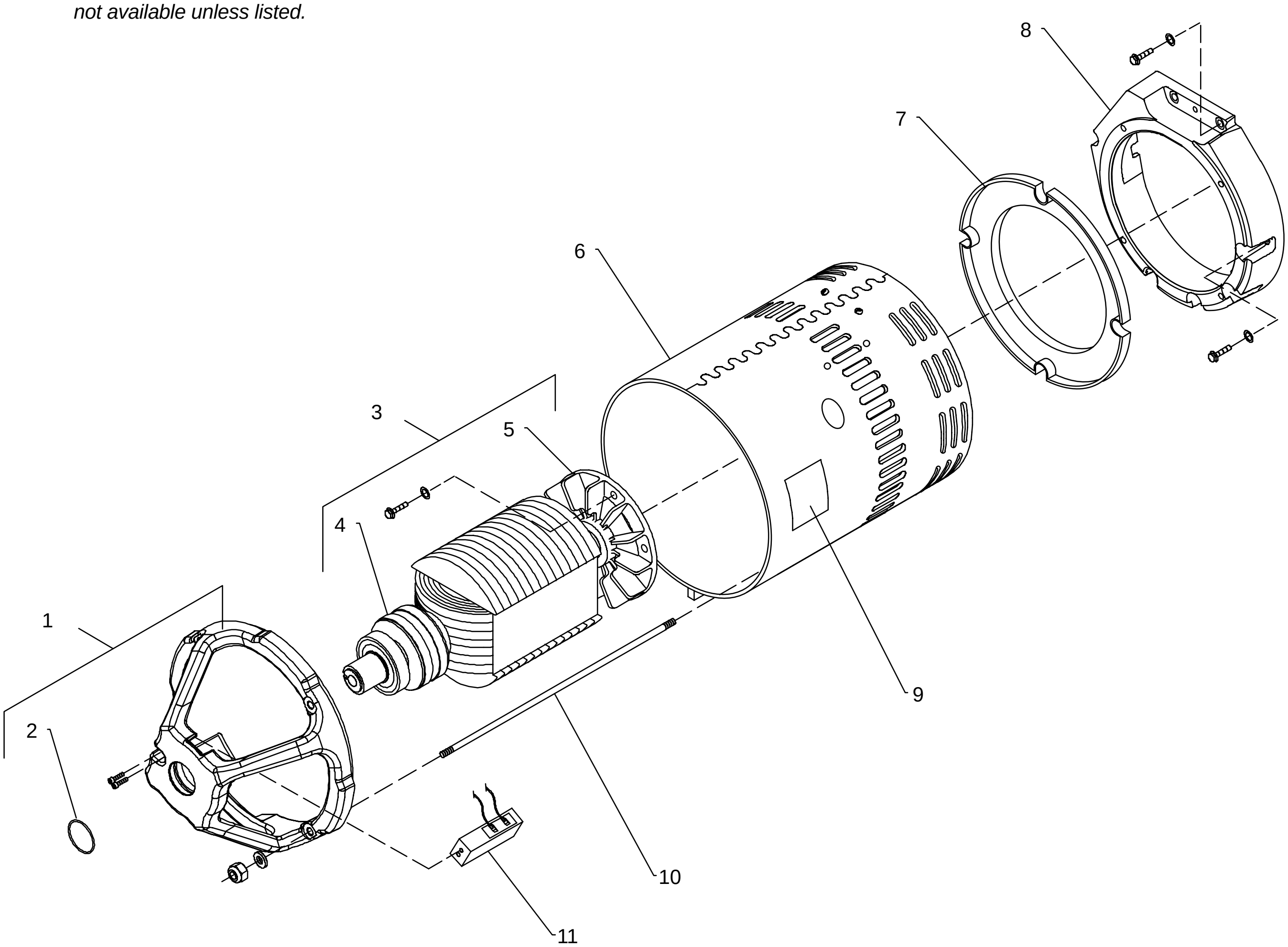



**Figure 12-4. Generator**

| Item No. | Dia. Mkgs. | Part No. | Description | Quantity |
|---|---|---|---|---|
| | | | **Figure 12-4. Generator Assembly (Figure 12-1, Item 30)** | |
| .. 1 | | 217 046 | .. ENDBELL (includes) | 1 |
| .. 2 | | 216 532 | .... RING, tolerance | 1 |
| .. 3 | | 213 388 | .. ROTOR, generator (consisting of) | 1 |
| .. 4 | | 181 143 | .... BEARING, ball rdl sgl row .984 x 2.047 x .591 | 1 |
| .. 5 | | 192 600 | .... FAN, rotor gen | 1 |
| .. 6 | | +212 957 | .. STATOR, generator | 1 |
| .. 7 | | 159 918 | .. BAFFLE, fan | 1 |
| .. 8 | | 193 515 | .. ADAPTER, engine | 1 |
| .. 9 | | 013 367 | .. LABEL, warning moving parts | 2 |
| .. 10 | | 170 861 | .. STUD, stl .375-16 x 17.375 | 4 |
| .. 11 | | 205 725 | .. BRUSHHOLDER ASSY, generator | 1 |

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
*Recommended Spare Parts.

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Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to a North American distributor or eighteen months after the equipment is sent to an International distributor.

1. 5 Years Parts — 3 Years Labor
   * Original main power rectifiers
   * Inverters (input and output rectifiers only)
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Inverter Power Supplies
   * Intellitig
   * Maxstar 150
   * Engine Driven Welding Generators
     **(NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor Unless Specified
   * DS-2 Wire Feeder
   * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
   * Process Controllers
   * Positioners and Controllers
   * Automatic Motion Devices
   * RFCS Foot Controls
   * Induction Heating Power Sources
   * Water Coolant Systems
   * Flowgauge and Flowmeter Regulators (No Labor)
   * HF Units
   * Grids
   * Maxstar 85, 140
   * Spot Welders
   * Load Banks
   * Racks
   * Running Gear/Trailers
   * Plasma Cutting Torches (except APT & SAF Models)
   * Field Options
     (NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts
   * MIG Guns/TIG Torches
   * Induction Heating Coils and Blankets
   * APT & SAF Model Plasma Cutting Torches
   * Remote Controls
   * Accessory Kits
   * Replacement Parts (No labor)
   * Spoolmate Spoolguns
   * Canvas Covers

Miller’s True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, slip rings, relays or parts that fail due to normal wear. (Exception: brushes, slip rings, and relays are covered on Bobcat, Trailblazer, and Legend models.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer’s warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller’s option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer’s risk and expense. Miller’s option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

Miller®

# Owner's Record

Please complete and retain with your personal records.

| | |
|---|---|
| Model Name | Serial/Style Number |
| Purchase Date | (Date which equipment was delivered to original customer.) |
| Distributor | |
| Address | |
| City | |
| State | Zip |

# For Service

***Call 1-800-4-A-Miller or see our website at www.MillerWelds.com to locate a DISTRIBUTOR or SERVICE AGENCY near you.***

Always provide Model Name and Serial/Style Number.

| | |
|---|---|
| Contact your Distributor for: | Welding Supplies and Consumables<br>Options and Accessories<br>Personal Safety Equipment<br>Service and Repair<br>Replacement Parts<br>Training (Schools, Videos, Books)<br>Technical Manuals (Servicing Information and Parts)<br>Circuit Diagrams<br>Welding Process Handbooks |
| Contact the Delivering Carrier to: | File a claim for loss or damage during shipment.<br>For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department. |


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